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ABSTRACT

This volume includes the abstracts of 112 research papers presented at the 1971 American Association of Health, Physical Education, and Recreation convention in Detroit, Michigan. Abstracts from the following symposia are also included: a) The Role of Perception in Learning Movement Activities; b) The Academic Discipline and the School Program: Bridging the Gap between Research and Practice; and c) Social Psychology of the Experimental Milieu. Each abstract includes the time and date on which the paper was presented at the convention. The name and address of the author follows each abstract. An author index completes the volume. (BRB)

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ABSTRACTS

of Research Papers 1971

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PREFACE

This edition of Abstracts of Research Papers includes abstracts, exactly as submitted by the authors, of the 112 papers scheduled for presentation at the 1971 Detroit convention. In addition, summaries of three symposia are included.

An attempt has been made to group papers by subject matter. Factors limiting this attempt included time limits imposed for individual sessions in relation to the number of papers dealing with a given topic as well as avoidance of conflicts with other commitments for those reporting studies.

The number at the bottom of the page in this publication is the number assigned to the study and corresponds with the number appearing in the convention program. The time and date each paper will be presented are indicated in the lower left-hand corner of each page. The name and address of the author to whom inquiries for further information may be sent appear in the lower right-hand corner. An index of all authors is provided at the end of the volume.

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Abstracts Editor
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ACKNOWLEDGEMENTS

Sincere appreciation is expressed to T. L. Doolittle, Marion Broer, Hal Lawson, Bonnie Purdy, Frank Smoll, and Maryann Waltz for their time and effort spent in planning the symposia and in reviewing studies submitted for presentation as well as for their advice and assistance in arranging the program.

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REMINISCENCE AMONG MENTALLY RETARDED AND NORMALS AS A FUNCTION OF AGE. David M. Auxter, Slippery Rock State College

The purpose of this study was to compare mentally retarded and normal populations on reminiscence as it relates to age. Forty mentally retarded Subjects and 40 normal Subjects participated in this study. Two groups each, of normals and mentally retarded, varying in age were selected for comparison. One normal group was composed of 20 Subjects; age range 9 years to 11 years The mean age was 10 years and 1 month. A second group of normals (N = 20) had an age range of 15 to 17 years. The mean age was 16 years and 2 months. One mentally retarded group was composed of 20 Subjects from 9 to 11 years with the mean age of 10 years and 3 months. The IQ range of this group was 50-74 and the mean IQ was 58. The other group of retardates was composed of 20 Subjects. The age range was 15 to 17 years with the mean age of 16 years and 1 month. The IQ range was 50 to 71; and the mean IQ was 57. The instrument used to measure learning was the stabilometer. Each subject performed 20 trials. Five trials were administered on four successive days with a 20 second rest interval between each trial on a given day. Reminiscence was, in this case, the increase in score due to the 24 hour rest interval between each block of five trials presented each day. Analysis of variance on the three post rest trials was performed to study reminiscence. The results indicated that the older normal group was superior in reminiscence during the first two post rest sessions than both mentally retarded groups, and the 9 to 11 year old normal group. However, there were no significant differences in reminiscence between the young and old mentally retarded groups and the 9 to 11 year old normal group. The findings of the study indicate the following: 1) reminiscence effect is related to age among normal populations 2) reminiscence does not appear to be related to age among the mentally retarded 3) reminiscence is greater among 15 to 17 year old normals than the mentally retarded of comparable CA. However, there does not appear to be a difference in reminiscence between 9 to 11 year old normal and mentally retarded children.

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April 3, 1971
10:15 a.m.

OVERLEARNING AS A VARIABLE IN THE RETENTION OF GROSS MOTOR SKILLS BY THE MENTALLY RETARDED. William C. Chasey, The University of Texas at Austin.

Practice that goes beyond an initial success level is termed overlearning, and is done to insure adequate retention over varying periods of time. Numerous occupational opportunities are available for the mentally retarded to become self-sufficient which are motor skill oriented, and require little generalization of skill or mental practice. The purpose of this study was to determine the effect of motor skill overlearning on retention by institutionalized mentally retarded subjects. The subjects for this investigation were 98 mentally retarded individuals institutionalized at the Austin State School, Austin, Texas. The subjects ranged in age from 94 months to 328 months (mean 174.5 months), and in I. Q. from 15.61 to 94.39 (mean 49.17), as measured by the Stanford Binet Intelligence Scale, Form L-M. In terms of eliology, 19 subjects were mongoloid, 3 hydrocephalic, 28 encephalitic, 11 cultural familial, 1 congenital cerebral and 36 unknown. The criterion measure of motor learning was a modification of the Johnson Mat Test. Two levels of motor learning were selected and subjects were randomly assigned to group I (learning) and group II (overlearning). Learning occurred when the subjects completed Level I and Level II one time without error. Overlearning occurred when the subjects completed Level I and Level II three consecutive times without error. Subjects were retested for retention four weeks after the initial learning session. Analysis of the data indicated that (1) mentally retarded subjects who overlearned the motor learning task maintained significant retention of the task after four weeks of no reinforcement, (2) the mentally retarded subjects who overlearned the motor learning task were superior in retention after four weeks of no reinforcement to those subjects who learned but did not overlearn the task.

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April 3, 1971
10:30 a.m.

STRAIGHT LINE COPYING ABILITY OF MENTALLY RETARDED MALES. Waneen Wyrick, The University of Texas at Austin.

The purposes of this study were to determine the a) ability of educable mental retardates to trace, with and without visual cues, a straight line in the sagittal plane of the body from the midline and from a point laterally displaced but parallel to the midline of their body, b) effect of visual cues upon their drawing performance, c) effect of practice under one visual or nonvisual condition on performance of the other, and, d) variability and relationship of their performance on both tasks under visual and nonvisual cues. Sixteen EMR adult males completed eight trials at two copying tasks under varying conditions of visual feedback and order of feedback. The experimental design was a single group, repeated measures design, in which each subject completed four trials, two with vision and two without vision, at each of the two tasks. Testing order of visual condition and copying task was randomly rotated among subjects. The Medial copying task was to trace a straight line printed on a sheet of graph paper. The Lateral task was to trace a line displaced 8" to the right but parallel with the medial line. Criterion measures were absolute deviations from the line at 5 and 10 inch marks from the starting point. Adult EMRs were accurate under conditions of vision, but deviations from the line were significantly greater under conditions of no vision for both the lateral and medial tasks. Subjects did not deviate significantly more from the lateral task than they deviated from the medial line. Practice under one visual condition had no effect upon performance of the other. The EMRs were almost twice as variable in their copying performance under conditions of vision than under conditions of nonvision. Low reliability was evident from the first to the second trial on both tasks, and relationships between performance in the medial and lateral tasks were low.

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April 3, 1971
10:45 a.m.

THE EFFECTS OF ADAPTED PHYSICAL EDUCATION UPON THE SOCIAL ADJUSTMENT AND MOTOR PROFICIENCY OF EDUCABLE MENTALLY RETARDED GIRLS.

Kela O. Adams, Indiana University

The purpose of the study was to determine the effects of a one semester adapted physical education program upon the motor proficiency and social adjustment of educable mentally retarded (IQ 50-79) junior high school girls. Three treatment groups were derived by random selection of subjects from two public junior high schools. Experimental subjects (totalling 21 EMR girls) were taught adapted physical education by the experimenter on alternate days for one semester. Control groups (one consisting of 20 EMR's and another consisting of 23 intellectually normal girls) retained placement in regular physical education programs as they existed at the schools. Approximately one-half of each treatment group was drawn from each cooperating school. Subjects were tested prior to and following the semester and comparisons were based on scores on the KDK-Oseretsky Tests of Motor Development, Cowell Social Adjustment Index, and Cowell Personal Distance Scale. Analysis of variance was used to compare the treatment groups on the basis of February scores, May scores, difference scores, and net gains. Based upon the findings associated with this study, the following conclusions seem justified: participation of EMR girls in physical education is associated with greater motor performance gains than noted among intellectually normal girls receiving the same amount of instruction: however, the adapted program appears to be no more effective than the regular program in promoting motor development among EMR girls. Social adjustment among EMR girls appears to be better achieved through participation in adapted physical education programs rather than through retention in regular physical education classes.

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April 3, 1971
11:00 a.m.

A PROSPECTIVE EPIDEMIOLOGICAL STUDY OF YOUTH SMOKING. Thomas W. O'Rourke, Ph.D., M.P.H., University of Illinois.

Purpose - The purpose of this study was to assess the predictive ability of the University of Illinois Survey Instrument in terms of identifying those attitude-belief factors and descriptive variables which may be predictive of smoking behavior. Procedure - The students included in this study were those seventh graders who classified themselves as never smokers on the initial survey of the schools in Winnebago County, Illinois conducted by the University of Illinois Anti-Smoking Education Study in October, 1966. Only those students who participated in all three surveys over the two year period (1966-1968) were included. A total of 784 boys and 1,143 girls comprised the study population. The data were treated separately by sex. For the purpose of predicting a smoking behavior score, a multiple regression analysis was utilized. In the present study the criterion was the smoking behavior as indicated on the third survey in 1968. The composite included the descriptive variables and attitude-belief factors of the initial survey. Results - For the seventh grade boys the multiple correlation of the five attitude-belief factors and sixteen scalable descriptive variables was .36 which accounted for approximately 13 percent of the variance. The corresponding multiple correlation for the seventh grade females was .27. This represented approximately 7 percent of the variance. With respect to the step-wise analysis, it was shown that the item, "Do you think you will smoke cigarettes at some future time" was the item accounting for most of the variance in the correlations for both the boys and girls. For the boys, the multiple correlations of this variable was .26. The multiple correlation for all twenty-one independent variables was .36. For the girls, the value entered for this variable was .20 while the multiple correlation for all twenty-one independent variables was .27. Conclusions - Results of the analysis indicated that the University of Illinois Survey Form does not appear to be a valid predictive instrument for assessing future smoking or non-smoking behavior of seventh grade school youth. Items focusing on the person viewing himself in terms of future behavior might serve as better predictors than attitude-belief or descriptive items which are orientated to the present time dimension. Past studies support the notion that smoking behavior to be such a complex act that the assumption of a linear relationship in this study may be unwarranted in attempting to predict whether an individual will remain a never-smoker or become a smoker.

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April 3, 1971
11:15 a.m.

THE CONSTRUCTION AND STANDARDIZATION OF A HEALTH KNOWLEDGE TEST FOR COLLEGE STUDENTS. Robert R. Blackburn, Gardner-Webb College.

The purpose of this study was to construct and standardize a health knowledge test for college students using the analogy form of question. Methodology included the establishment of curricular and statistical validity. Curricular validity was established by an analysis of ten textbooks used in the basic health course, thirty-eight courses of study, and the existing health knowledge tests. These sources were used to develop a content outline and area emphasis for the test. Test items were then constructed using the analogy form of question with four alternate responses. The test items were then submitted to a "panel of experts" who evaluated the test items using the criteria of appropriateness for the test, clearness of thought, and scientific accuracy. Those test items which were acceptable were then placed in two preliminary forms for test administration. The preliminary and final test subjects were drawn from students who had completed the basic health course in colleges and universities throughout the United States. The schools were selected from the six districts of the American Association for Health, Physical Education, and Recreation. Flanagan's Technique was selected to determine statistical validity. After the preliminary tests had been given, statistical analyses of the preliminary tests were computed. From the total sample for each of the preliminary tests, the top twenty-seven percent and bottom twenty-seven percent of the papers were drawn. Test items retained for use in the final form had an index of discrimination of .30 or better, a level of difficulty between .85 and .15, and responses selected by at least three percent of the sample analyzed. In the statistical analyses of the final test, the mean index of discrimination was .42. The reliability coefficient for the final test was .86 using the test-retest method. National percentile norms were established based on 1,399 scores. Conclusions. A final objective health knowledge test has been developed which is valid and reliable. The test is designed to test the health knowledge of students who have completed the basic health course. The final test may complement an instructor's final test and aid him in evaluation of course content and methodology. The analogy item may be used to test knowledge objectives. The analogy item allows for a greater sampling of the content material in the test.

Dr. Robert R. Blackburn
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April 3, 1971
11:30 a.m.

THE EFFECT OF A SPECIFIC EXERCISE PROGRAM ON SELECTED HEALTH RELATED FITNESS PARAMETERS OF COLLEGE FRESHMEN. John Chevrette, Texas A&M University; Homer Tolson, Texas A&M University.

The purpose of the study was to determine the effect of an individualized program of exercise of four weeks duration on selected endurance and strength parameters of college freshmen. The subjects were 199 freshmen college students enrolled at Texas A&M University Adjunct during the summer session of 1969. The program of physical education provided for individualized and ability group instruction based on pre-test findings. A Narragansett back and leg dynamometer was used for strength testing and a Stargell hand dynamometer was used for grip strength measurements. Resting heart rate and Cooper's 12-minute field tests were used on the cardiovascular areas of testing. The difference between post-test and pre-test means were calculated and tested for significance utilizing a paired observation t-test. A matrix of simple correlation coefficients was obtained on the variables of interest. All statistical tests were conducted at the .01 level of significance. Based on the results of the study, the following conclusions appeared to be warranted: (1) the health related parameters of physical fitness can be altered significantly within a relatively short period of time, (2) it would appear that a daily class of one hour and twenty minutes duration is sufficient time allocation to make significant changes in health related aspects of fitness, (3) the idea that strength and cardiovascular endurance are two separate health related components was reinforced, (4) jogging and distance running can make a contribution to leg strength, (5) performance on the 12-minute field test can be affected significantly by a daily exercise program which includes endurance type training, (6) a lower resting heart rate can be expected as a result of a daily excise program of the nature of the one administered to the subjects in the study.

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April 3, 1971
11:45 a.m.

THE CHRONIC EFFECTS OF EXERCISE ON SELECTED BIOCHEMICAL AND PHYSIOLOGICAL VARIABLES. Don L. Corrigan, A. H. Ismail, D. F. MacLeod, Purdue University, Lafayette, Indiana.

The objective of this study was to investigate the chronic effects of exercise on selected physiological and biochemical variables. A group of 64 adults ranging in age between 23 and 62 years participated in an eight-month physical fitness program. The subjects were divided into two groups with those designated experimentals participating in an organized fitness program three times per week while the second group continued their normal daily activity and were designated controls. Ten physiological variables and two biochemical variables measured at four stages of metabolic stress were assessed prior to, at approximately the middle, and at the conclusion of the fitness program. The ANOVA was used for the analysis of data. No significant differences were found amoung test means for the experimental groups for body weight, submaximal volume ventilation and maximum volume ventilation. Significant differences were found for per-cent lean, resting heart rate, submaximal heart rate, submaximal oxygen uptake, and maximal oxygen uptake. Serum glucose measured at four metabolic stages -- rest, following submaximal exercise, following maximal exercise and a 15 minute recovery period were significantly increased during the eight-month fitness program. Serum total cholesterol mean values did not significantly change at any of the measurements. None of the physiological or biochemical variables showed any significant difference for the control group. It was concluded that the oxygen absorption, transport and utilization systems were improved by the eight-month physical fitness program. The increase in serum glucose could not be explained, but it was hypothesized that a change may be expected in the body's energy substrate preference. Total serum cholesterol did not improve; however, lower values were found at the conclusion of the program for all experimental subjects.

Don L. Corrigan
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April 3, 1971
2:00 p.m.

LEVELS OF BIOCHEMICAL INTERMEDIATES DURING MUSCULAR CONTRACTION IN THE RAT

D. W. Edington and Graham Ward, University of Massachusetts, Amherst.

Male albino rats (140-180 days of age) were made to run on a rodent treadmill for 16 weeks. The rats were capable of running 2100 meters, five days per week, on an 8° slope at 30 meters per minute. The "trained" rats along with their "non-trained" sedentary controls were anesthetized with pentobarbital and the gastrocnemius-plantaris muscle group was prepared for in-vitro muscle stimulation. The achilles tendon was severed and attached to a 36-gram load. The nerve was severed 2 centimeters proximal to the muscle and a nerve stimulation clamp was applied. Responding to 2 contractions per second, the left leg worked until quick-frozen between aluminum clamps pre-cooled in liquid nitrogen. Work time was 0-time, .5 minutes, or 10 minutes. The muscles (left and the right leg control) were pulverized, extracted in acid, and prepared for the specific enzymatic or colorimetric techniques. Assays were performed in triplicate as were the standards that were assayed each time.

The results are explained in terms of a compartmental model that describes the muscle as a non-homogeneous tissue. The oxidation-reduction state of the muscle cell varies from one compartment to another. The lactate/pyruvate ratio was not indicative of the total oxidation-reduction state of the muscle.

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April 3, 1971
2:15 p.m.

EFFECTS OF MAXIMAL AEROBIC EXERCISE ON PLASMA ADRENALIN AND NORADRENALIN LEVELS IN COLLEGE MALES. Donald A. Olewine, Frank H. Ramsey, Georgia Southern College; Michael T. Simpson, Rudolf Meier, Curtis G. Hames, Hames Clinic, Claxton, Georgia.

The purpose of this study was to determine blood adrenalin and noradrenalin changes produced by maximal aerobic exercise. The group was seven male college students with the following characteristics: Age - 24 ± 1.5 years; physical fitness - 11.5 ± .4 Mets; non-smokers; height - 71 ± 0.9 inches; weight 174. ± 8.5 lbs. Each subject was given at least one preliminary treadmill test to become familiar with the testing procedure. All were asked to conform to the following: (1) No medication of any kind during the 7 days preceding a test. (2) No strenuous exercise during the afternoon and evening before a test. (3) No breakfast or coffee until after completion of a test. All tests were conducted between 6:30 - 10:30 A.M. Following 30 minutes of quiet rest in a horizontal position, a resting venous blood sample was obtained. The subject then walked on the treadmill, using the Balke procedure, until a heartrate of 180 was attained. Immediately following exercise the subject returned to a reclining position and a second blood sample was obtained. A recovery sample was obtained fifteen minutes later. The blood samples were analyzed to determine adrenalin and noradrenalin levels by using the fluormetric technique. The mean resting heartrate in a reclining position was 57.4 ± 1.07. The end point of 180 beats/min. was achieved without any significant change in the plasma adrenalin level. However, the plasma noradrenalin concentration was significantly increased (rest - 2.15 ± 0.22 versus exercise - 4.22 ± 0.41 y gm/liter). In both adrenalin and noradrenalin the ratio of exercise/rest plasma level was significantly elevated (adrenalin 1.71 ± 0.30 and noradrenalin 1.99 ± 0.12). By fifteen minutes after exercise the adrenalin and noradrenalin plasma levels were not significantly different from resting values. However, the recovery/rest ratio for noradrenalin was still significantly increased (1.28 ± 0.08).

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April 3, 1971
2:30 p.m.

THE EFFECTS OF VARIOUS AMBIENT TEMPERATURES, RELATIVE HUMIDITIES AND EXERCISE LEVELS ON THE CONCENTRATIONS OF URIC ACID IN PLASMA. Wayne H. Osness, University of Kansas and Jacquelyn Thoroughman, Aroostook State College, Maine.

The purpose of this study was to determine the effects of various ambient temperatures, relative humidities, and exercise levels on the concentration of uric acid in the plasma of three male subjects at the University of Kansas. Each of the subjects was tested at steady state exercise level under 100 different test conditions including the temperatures of 38, 56, 74, 92, and 110 degrees Fahrenheit; humidities of 19, 46, 73, and 95 per cents; and exercise levels of 0, 300, 600, 900, and 1200 kilopond meters. Each test was preceded by a standardized dietary intake two hours before testing, and extraction of a resting blood sample 30 minutes before testing. Each test included a 20 minute acclimatization period prior to exercise, eight minutes of steady state exercise with the exercise blood sample extracted during the seventh minute, and five minutes of recovery. The plasma samples were analyzed at a commercial laboratory yielding concentration data for uric acid and eleven other plasma metabolites for each of the three subjects during the one hundred tests. Means and standard deviations were computed and the analysis of Variance and Duncan's New Multiple Range Tests were applied to determine the significance of differences among sets of mean scores. Correlations were computed between uric acid and eleven other plasma metabolites and between uric acid and hematocrit values. The results of the study revealed that (1) There was no significant difference in the mean values for the five temperature levels; (2) A significant difference occurred between the mean value for Humidity One and Humidity Three; (3) Exercise variation had the most significant effect on uric acid with exercise levels 0 and 300 KPM being significantly different from levels 600, 900, and 1200 KPM; (4) A significant negative correlation was found to exist between uric acid and blood urea nitrogen; (5) A significant negative correlation was found to exist between uric acid and cholesterol; (6) A significant negative correlation was found to exist between uric acid and triglyceride; and (7) A significant negative correlation was found to exist between hematocrit and uric acid.

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April 3, 1971
2:45 p.m.

VARIABILITY OF BODY POTASSIUM-40 IN HUMAN FEMALE SUBJECTS[1]

Cheryl J. Cohen
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A whole-body liquid scintillation counter was calibrated for measurement of ^{40}K in human female subjects using the radioisotope ^{42}K. Body weight accounted for most of the variation in counting efficiency, with little additional variation attributable to differences in height or other body measurements made on the subjects. Variation in body potassium among female subjects was estimated from a regression of potassium on body weight. A standard error of estimate of 11.7 gm indicated considerable variation in body potassium beyond that attributable to weight. Comparison of the standard error of estimate among subjects to the standard deviation calculated from day-to-day variation within subjects, yields a ratio of between 2 and 4. For any given subject, if the ratio is closer to 2 then day-to-day changes are an important source of variation. Four female subjects were measured frequently during a 30-day period of time. No specific trend in variability could be found in body potassium from one phase of the menstrual cycle to another. The similarity of data between the oldest female subject (56 years) and the two male subjects might be attributed to menopause; however, the menstrual cycle cannot be assumed to cause the potassium mass variation in the remaining three female subjects because of the low variability in one of these subjects. The range of the coefficients of variation for the female subjects (2.36-4.77) indicates unknown sources of variation may contribute considerable variation in body potassium.

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1. This study was conducted at the Illinois Animal Sciences Counter Laboratory, Dr. Tim G. Lohman, Dept. of Animal Sciences, Director.
Guidance in the conduct of this study was received from Dr. Lohman, and also from Dr. Laura J. Huelster, Dept. of Physical Education for Women, Univ. of Illinois.

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April 3, 1971
3:00 p.m.

EFFECTS OF THREE DIFFERENT DURATIONS OF ENDURANCE EXERCISE UPON SERUM CHOLESTEROL IN MIDDLE-AGED MEN

Ali Tooshi
Jersey City State College

Purpose: The purpose of this study was to compare the effects of 15 min. 30 min. and 45 min. per day progressive endurance exercise program upon serum cholesterol body composition, and certain cardiovascular and motor fitness measures in middle-aged men.

Method: Thirty-two men between 27 to 54 years of age were randomly assigned to one of the four groups on the basis of their initial blood cholesterol. Groups I, II, and III, exercised 15, 30, 45 min. a day respectively. Group IV served as the control group. The experimental groups exercised five days a week for a total of 20 weeks with the same intensity and frequency.

Fasting serum cholesterol, body composition, resting pulse rate, blood pressure, and brachial pulse wave were measured in the morning. A two-mile run and an all-out treadmill run (7 mph. at 8.6) test was administered at the end of the first six weeks of training. Average daily caloric cost of exercise for each group was calculated.

Results: The results of the study showed that the 45 min. exercise group made a significant reduction in serum cholesterol and body fat. Significance was at the level of .05 and .01 respectively. This group improved in all other test items significantly (.01 level). The 30 min. group did not show a significant change in cholesterol but a significant improvement was made in other test items. The 15 min. exercise group made a significant improvement only in the motor fitness tests. Average daily caloric cost of the exercise for groups I, II, and III, was 280, 560 and 880 calories per day respectively.

Conclusion: Less than 45 min. exercise a day or exercise costing less than 600 calories per day seems to be insufficient to bring about a significant reduction in serum cholesterol.

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April 3, 1971
3:15 p.m.

A STUDY TO DETERMINE THE EFFECTS OF TRAINING AT PRE-DETERMINED HEART RATE LEVELS IN COLLEGE WOMEN. Marigold A. Edwards, University of Pittsburgh

The study measured the effectiveness of a predetermined training intensity to induce cardiovascular improvements in sedentary college women. It was an attempt to clarify the question, "When does an exercise become training?" or "What work intensity is necessary for cardiovascular changes?" -- quantitatively, an unresolved issue pertaining to the dosage of exercise. Twelve subjects, aged 17 to 21 years, participated in the treadmill training program, fifteen minutes daily for four weeks. Six subjects (Group 1), trained at a heart rate of 125 beats per minute and six subjects (Group 2), trained at a heart rate of 145 beats per minute. Treadmill speeds were regulated during each training session so that the work intensity remained at the predetermined heart rate level. The test battery included basal HR and "all out" treadmill test variables (time at HR 180, maximum oxygen intake, maximum HR, and test run time) at pre- and post-training; mid- and post-training re-runs at the second training day treadmill speeds; and treadmill speeds throughout the training. The t test in various forms was used to treat the pre, pre- to -post, and post-training data. Group 1 showed significant increases in the time required to elicit a heart rate of 180 beats per minute and maximal oxygen intake, while Group 2 significantly increased total run time and maximal oxygen intake. It was concluded that a work intensity eliciting a heart rate of 125 beats per minute provided sufficient but not minimal stimulus for training effects in sedentary young females.

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April 3, 1971
3:30 p.m.

SPECIFICITY OF TRAINING AS INDICATED BY HEART RATE RESPONSE TO TREADMILL EXERCISE. G. Harley Hartung, Central Missouri State College.

The purpose of this study was to determine if training specificity could be found in two groups of trained and a group of nontrained subjects with respect to heart rate changes during exercise and in recovery. Thirty subjects, twenty trained endurance athletes (ten runners and ten swimmers) and ten healthy male students, were subjected to graded treadmill walking until reaching a heart rate of 170. The runners were considered to be performing work for which they were conditioned, but the swimmers were performing an activity not directly involved in their training. Heart rate was determined electrocardiographically at the end of each minute during exercise and recovery. Times to reach heart rates of 110, 130, 150 and 170 during exercise and 130 and 90 in recovery were recorded as the criterion measures. The runners were found to perform significantly better in mean endurance time than the swimmers at each heart rate level even though both groups had undergone extensive endurance training for their respective sports. The swimmers did not perform significantly better than the nontrained subjects except at heart rate 130. The indication was that heart rate response to exercise is specific as to the type of training and that general or nonspecific training is not significantly better than no training. In recovery to heart rate 130 there was no significant difference among the means of the three groups. The runners did not recover significantly faster to the final recovery heart rate (90) than did the swimmers. The swimmers did not reach the final recovery rate significantly faster than the nontrained group. These results tend to show that the use of the recovery heart rate is probably not valid as an indicator of cardiac efficiency or level of fitness.

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April 3, 1971
3:45 p.m.

Changes In Oxygen Consumption During Submaximal Work Resulting From Training. Robert N. Girandola, City College.

The purpose of the study was to determine the quantitative changes in oxygen consumption during exercise and recovery, during submaximal work following a period of physical training. Thirty-three college men underwent 10 weeks of endurance-type training; an equal number served as controls. The work task was a 10-minute ride on a bicycle ergometer at a standard load of 1080 kpm/min. Min-by-min $\dot{V}O_2$ values were obtained during the exercise and for 15 minutes of recovery. The same test was administered following training. The total gross oxygen consumption for the control group for Test I was 24.675 liters during exercise and 9.396 liters during recovery. The values for Test II were 24.703 liters and 9.518 liters during exercise and recovery, respectively. The differences between Tests I and II were not statistically significant for the control group. For the experimental group total gross oxygen consumption for Test I was 24.458 liters during exercise and 9.233 liters during recovery. After training the values were 24.846 and 8.923 liters. The decrease in $\dot{V}O_2$ during recovery was statistically significant, however the increase in $\dot{V}O_2$ during exercise did not reach significance. The $\dot{V}O_2$ values were then cumulated min-by-min. The control group showed no significant difference in $\dot{V}O_2$ between Test I and II using the cumulated $\dot{V}O_2$ values. However, for the experimental group during exercise, Test II values were significantly higher than Test I values from minute 3 to minute 9. This indicated a decrease in the oxygen deficit. During recovery Test II values were significantly smaller than Test I values from minute 10 to minute 15, indicating a decrease in the lactate portion of the oxygen debt. It was concluded that a program of endurance-type training will result in a decrease in the oxygen deficit and also a decrease in the lactate portion of the oxygen debt. However the magnitude of the decrease in oxygen debt was not as great as expected based on the size of the decrease in oxygen deficit. As a result the total gross oxygen intake required for a standard submaximal work task, such as the one used in this study remained unchanged.

Robert N. Girandola
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April 3, 1971
4:00 p.m.

EFFECTS OF TRAINING AND DETRAINING ON CARDIOVASCULAR EFFICIENCY.
Zebulon V. Kendrick, Thomas N. Hickman, Michael I. Pollock,
Wake Forest University.

The purpose of this investigation was to determine the effects of training and detraining on cardiovascular efficiency. Twenty-one volunteer men, between 30 and 45 years of age ($\bar{x}$ = 38.1) jogged approximately eight miles per week for 20 weeks at 85% of maximum heart rate. A control group of eight sedentary men were also tested. Heart rate and blood pressure response to a standard treadmill run (5 min, 6 mph, 2.5% grade) was used to evaluate the cardiovascular efficiency of each group, and was administered initially (T_1), after twenty weeks of training (T_2), and after 12 weeks of additional training, detraining or combination thereof (T_3). That is, from T_2 to T_3 groups were divided into subgroups according to miles trained/week in the following manner: Group A< 1 (n = 7); B< 5 (n = 6); and C> 6 (n = 8). Heart rates were recorded continuously via a biotelemetry system. The experimental group's heart rate improved significantly from T_1 to T_2, while the control group's remained constant. These changes represented reductions from -10.3 to -21 beats/min. during exercise, and -21 to -29 beats/min. during recovery. Subgroup experimental results showed Group C to continue to improve in efficiency from T_2 to T_3, while A and B lost approximately 50% of their initial improvement recorded from T_1 to T_2. No differences were noted between Groups A and B from T_2 to T_3. Resting heart rate showed a relationship similar to exercise and recovery rates, with reductions from 68.5 to 61.8 beats/min. from T_1 to T_2. It was concluded that a) additional weeks of training result in further increases in cardiovascular efficiency, and b) detraining during the summer months results in approximately 50% reduction in initial improvement in efficiency.

Michael I. Pollock
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April 3, 1971
4:15 p.m.

A COMPARISON OF CONTINUOUS SLOW RUNNING, INTERVAL, AND PACE TRAINING METHODS ON RUNNING PERFORMANCE. James H. Johnson, Washington University.

Subjects for the study were 120 college freshmen enrolled in physical education conditioning classes. All subjects were tested initially and finally on an all out run on a treadmill at 10 mph, at 8 1/2 mph, and on a mile run. Subjects were placed into one of three training groups. Group I, the slow continuous running group, trained at a relatively slow continuous pace by running twenty to thirty minutes each session. Group II, interval training, utilized both fast and slow interval training on alternate days. Group III, the pace group, trained at a predetermined steady pace for a mile run. Each subject trained at this prescribed pace for as long as he could maintain the pace or complete a mile. Each subject ran only once at each training session, and as soon as each individual finished one mile at the set pace, he would begin training at a faster pace. All subjects trained three times weekly for eight weeks. A t-test was utilized to analyze mean gains between initial and final scores. Analysis of covariance and orthogonal comparisions were employed to analyze differences among the groups. It was found that all groups significantly improved performance on all three tests, and that the slow continous training group was significantly better on the slower paced treadmill run. It was further concluded that slower paced training was better for slower paced tests, and that interval and pace training were effective training methods to improve running performance.

Dr. James H. Johnson
Department of Physical Education
Washington University
Saint Louis, Missouri 63130

April 3, 1971
4:30 p.m.

THE EFFECTS OF HIGH SPEED TREADMILL RUNNING UPON SPRINTING SPEED. George B. Dintiman, Virginia Commonwealth University.

The purpose of this study was to determine the effects of high speed treadmill training upon sprinting speed. Secondary purposes were to uncover accurate techniques to measure the rate of leg movement per second and stride length during both treadmill and flat surface running. Eight male, undergraduate students were divided into two groups using matched pairs, on the basis of pre-test 20-yard dash times, age, height, and weight. The Experimental Group engaged in an eight week training program, three times weekly, consisting of weight training and high speed treadmill running. The Control Group participated in a weight training and conventional sprint training program. Treadmill running consisted of sprinting at maximum speed, at 1.5 to 2.0 m.p.h. beyond maximum speed, and at near maximum treadbelt speed (up to 26.5 m.p.h.) for the prescribed number of repetitions while supported in a suspended harness that permitted free arm movement. Pre- and post-test means were compared within each group to determine whether statistically significant improvement occurred in the 20-yard dash with a running start. The Experimental Group improved significantly from the pre- to the post-test while the Control Group failed to do so. Experimentation with the measurement of leg movement per second and stride length was concerned only with the most effective measurement procedures in these areas. No attempt was made in this study to attribute speed increases to any of these factors. Within the limitations of this study, it was concluded that high speed treadmill running is more effective in improving 20-yard dash times than a conventional program of sprint training when these programs are supplemented by weight training.

George B. Dintiman, Chairman
Department of Physical Education
Virginia Commonwealth University

April 3, 1971
4:45 p.m.

BODY COMPOSITION OF HIGH SCHOOL WRESTLERS. Frank I. Katch, Queens College of the City University of New York; Ernest D. Michael, University of California at Santa Barbara.

The body composition of 94 high school wrestlers, 15 to 18 years of age and 98 to 233 lbs, was measured using skinfolds and girth measurements. Three regression formulas were used to predict body density and percent body fat, and comparisons were made by age and by wrestling weight category. There was a 25% increase in total body fat from age 15 to age 18, while individual skinfolds increased 37% for the scapula, 28% for the iliac and 19% for the abdomen. The bicep showed a small increase of 2%, while tricep fat decreased 5%. When the wrestlers were grouped into one of 13 wrestling weight groups, the absolute skinfold values increased with weight increases. Comparing the two most extreme groups, the heaviest individuals had 208% more total skinfold fat and possessed almost four times as much body fat as the lightest individuals (15.5% compared with 4.2%). The rank-order correlation between wrestling weight and percent fat was r = .86; between weight and total skinfolds it was r = .96, and between percent fat and total skinfolds r = .93. When different regression formulas developed by other investigators were used to estimate density and fat, large and erratic deviations up to 115% of the criterion values were obtained. The predicted values of density and fat were lower than previously reported for age and weight matched groups of young athletes except with the heaviest weight groups. The increase in percent fat in the present sampling of subjects suggests that either heavier persons should be expected to have greater percent fat or that at the heavier weight levels the concern for weight control is not as important with the athlete who may feel it is advantageous to gain weight.

Dr. Frank I. Katch
Dept. of Health & Physical Education
Queens College
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April 3, 1971
5:00 p.m.

THE EFFECT OF DEHYDRATION AND SUBSEQUENT REHY-DRATION ON THE PHYSICAL WORKING CAPACITY OF COLLEGE WRESTLERS. William G. Herbert, Kent State University; Paul M. Ribisl, Kent State University.

Purpose. The purpose of this study was to measure the changed in predicted physical working capacity (PWC_{170}) in college wrestlers (1) after a weight loss incurred over a three to five day period, and (2) following weight recovery subsequent to a 5 hr. rehydration period. Procedure. To minimize the learning effect acquired through repeated exposures to the bicycle ergometer, each of the nine subjects performed four practice PWC_{170} rides prior to the experiment. In the experimental sequence, subjects were tested in two separate weeks of the competitive wrestling season under the following body weight conditions: (1) normal, at the beginning of the week; (2) dehydrated, at the weigh-in period on the day of competition, (3) rehydrated, just before competition. Mean weight deficits were 4.8% and 2.2% in the dehydrated and rehydrated conditions respectively. Statistical procedures included analysis of variance for repeated measures followed by application of Duncan's New Multiple Range Test, where appropriate. Results. Following both dehydration and rehydration, significant reductions in working capacity occurred. Rehydration resulted in a partial recovery in working capacity which was significantly higher than in the dehydrated state, but significantly lower than normal. A decrement in performance was only moderately related to a given weight deficit ($r = +0.47$), indicating that the degree impairment could not be accurately predicted from knowledge of a specific weight reduction. Depressions in the PWC_{170} following dehydration and rehydration were interpreted as reductions in maximum cardiovascular capacity and were attributed to circulatory inefficiency. Conclusion. It was concluded that wrestlers who dehydrate 5% to make their weight classifications and then do not completely rehydrate before meet time may experience significant reductions in cardiovascular endurance during competition.

William G. Herbert
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April 3, 1971
5:15 p.m.

RESEARCH ON ELECTIVE PROGRAMS OF BASIC INSTRUCTION IN AMERICAN UNIVERSITIES. Hal A. Lawson, University of Washington.

The primary purposes of the study were to ascertain the reasons for the elimination of college physical education requirements and to evaluate elective programs as feasible alternatives to required programs. A sample of ten universities with enrollments of at least 4,800 and with programs of professional preparation was purposively selected for the study. Visitations were made to each of the ten institutions. Questionnaires were utilized to gather data from both program directors and the instructional personnel. Original source data in the form of legislative proceedings and departmental records were also gathered. The results of the study were presented under two headings: the elimination of requirements (including who challenged the requirements, why they were challenged, and the reasons for their elimination) and a discussion of the conduct of elective programs. It was concluded that the future of required programs is questionable. Elective programs have demonstrated their feasibility in terms of attracting enrollments, but their future is contingent upon each university's perception of same.

Hal A. Lawson
School of Physical & Health Educ.
University of Washington
Seattle, Washington

April 3, 1971
2:00 p.m.

AN EXPLORATION OF CHOICE DIMENSIONALITY IN A VOLUNTARY COLLEGE PHYSICAL EDUCATION PROGRAM. Barbara Baxter Pillinger, Harvard University.

The purpose of this study is threefold: (1) to ascertain student attitude toward and actual participation in the voluntary physical education program at Radcliffe College, (2) to investigate specifically the difference in several psychological dimensions between those who choose to participate and those who do not, and (3) to study the role of choice in play, i.e., is forced play an anachronism? A questionnaire study was undertaken of an entire freshman class at Radcliffe College; 74% of the class responded. This group was one of the first to experience the voluntary approach to physical education at Radcliffe. The statistical indexes employed in reporting and analyzing the data are percentage and chi square. The dimensions that significantly differentiate the participant and the non-participant in the voluntary sports, dance, and recreation program at Radcliffe College are as follows: ($.05 < P < .001$)

AREA	MODAL CHARACTERISTICS PARTICIPANT	NON-PARTICIPANT
Self-Description	"All-American girl" Skillful in sports	"Intellectual" or "feminine type" Unskilled in sports
Mode of Operation	Both "inner and other-directed"	Largely "inner-directed"
Physical Education Requirement	Required	Voluntary
Reasons Favoring Voluntary Program	a. More likely to take part in sports throughout college years b. Find voluntary participation more beneficial and enjoyable	
Opinion of High School Program	Excellent-good	Fair-poor
Future Participation at Radcliffe	Yes	Undecided

Among the conclusions are certain theoretical implications: (1) Choices form the core of individuality; (2) The freely chosen is a way of studying individuality, for it is in the realm of the freely chosen that man is most himself; and (3) The fate of psychic energy in relation to freedom of choice is the essence of guidance, in education and in leisure.

Barbara Baxter Pillinger
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April 3, 1971
2:15 p.m.

A CRITICAL EVALUATION OF UNDERGRADUATE PROFESSIONAL PREPARATION IN PHYSICAL EDUCATION FOR MEN AND WOMEN IN SELECTED COLLEGES AND UNIVERSITIES OF NEW ENGLAND. Douglas C. Wiseman, Northeastern University.

A critical evaluation of undergraduate professional preparation was undertaken. Specifically, the problem was to study and compare the total, area (10), and sub-area (40) scores of institutions as determined by their conformance to the standards of A Score Card for Evaluating Undergraduate Professional Programs in Physical Education by Karl W. Bookwalter and Robert J. Dollgener. A population of 17 New England institutions was visited by the writer. Through the process of interviewing the directors, by personal library research, and by observing facilities and equipment, the conditions and practices were recorded and point values were assigned. Sub-area, area, and total scores were obtained by summing the values of the parts therein. Total and area scores were compared by institutions, between and within states, by financial support, by institutional and enrollment types, and by organizational structure. A general ranking of area scores, by per cent of attainment, was made. Correlations of areas and of areas to total were computed in order to determine the degree of relationship between same. Sub-area scores were compared, and a general ranking was made. Trends were indicated based on the analysis of the collected data. Cooperating institutions were notified as to the results of the findings inasmuch as such related to them. The names of the individual schools remained unrevealed. According to average attainment, institutions from Massachusetts met more of the standards of the score card than institutions from other states in New England; privately-supported institutions scored higher than state-supported institutions; institutions with university status scored higher than other institutional types; institutions with enrollments greater than 10,000 students scored higher than other enrollment types; and institutions having departments within a division or school scored higher than institutions having departments within the total. The evidence indicated a variation among the professional preparation programs being offered to men and women in New England. These differences were found with regard to institutions, between and within states, by financial support, by institutional and enrollment types, and by organizational structure. Incorporated within this structural hierarchy were variations within total, area, and sub-area scores.

Douglas C. Wiseman
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April 3, 1971
2:30 p.m.

THE 1970 STATUS OF PROGRAMS OFFERED BY DEPARTMENTS OF PHYSICAL EDUCATION IN JUNIOR COLLEGES POSSESSING AN ATHLETIC PROGRAM.
William F. Stier, Jr., Briar Cliff College.

The study consisted of an investigation into the following areas within the academic discipline of physical education and its component parts: (a) general characteristics of the institution, (b) curricular offerings and policies, (c) intramurals and extramurals, (d) athletics, (e) facilities, (f) budgeting, and (g) office management. One hundred and forty junior colleges were randomly selected to receive a seven page questionnaire. Seventy-four institutions participated for a 52.8% rate of response. The "model" institution views itself as a public liberal arts and vocational-technical junior college; is located in a population center of between 10,000 and 23,000 persons and operates on the traditional semester system. The "model" faculty member possesses the master's degree and has taught for more than five years. Responsibilities, in addition to teaching, are required of the faculty with coaching, intramural supervision and club supervision being the most common. A wide selection of activity or service classes are provided as a two year requirement and classes meet twice a week for fifty minutes. Co-ed activity classes are available. Various substitutions for activity classes are allowed as are cuts. Make-up sessions for missed service classes are provided. Adapted physical activity classes are not available. Grades awarded in the activity classes affect grade point average. Absences significantly affect a student's grade. Intramural activities are offered for men and women and a faculty member is present for all activities. A greater number and wider variety of activities are offered for women than for men on the extramural level. Personnel who coach must also teach. The institution does not provide scholarship assistance earmarked strictly for the athletic department. The institution provides for a separate departmental budget. Seventy-two percent of the respondents indicated that a gymnasium was available for the department's use. Conclusion. The present status of physical education programs indicate a comprehensive offering in activity classes as well as on the intramural and athletic level of involvement. Extramurals are severely limited. Well qualified and experienced faculty are actively involved in not only teaching responsibilities but also in supervisory positions. Generally, offerings and policies regarding operational and procedural matters within the department would seem to correspond positively with four year institutions and to be traditional rather than unique or radically innovative.

William F. Stier, Jr.
Chairman: H.P.E.R.
Briar Cliff College
Sioux City, Iowa 51104

April 3, 1971
2:45 p.m.

THE ROLE OF INDIANA UNIVERSITY IN THE DEVELOPMENT OF DOCTORAL DEGREE PROGRAMS IN HEALTH, PHYSICAL EDUCATION AND RECREATION.

Martilu Puthoff, State University College at Brockport

The purpose of this study was to determine the role of Indiana University in the development of doctoral degree programs in health, physical education and recreation. Historical method utilizing extensive primary sources was applied to trace the development of graduate education at Indiana. The results of this inquiry were analyzed and interpreted in light of existing records of the development of other doctoral programs in these cognate disciplines throughout the United States. Indiana University established an Ed.D. degree program with a major in physical education in 1930 preceded only by Stanford University and University of Pittsburgh in 1929. Indiana is credited also with conferring the first Ed.D. degree with a major in physical education in the United States. With the establishment of the School of Health, Physical Education and Recreation in 1946, Indiana developed new degree programs and there after granted a Doctor of Health and Safety, Doctor of Physical Education and Doctor of Recreation degrees in lieu of the Ed.D. degree previously granted. To these professional degrees was added a Ph.D. degree with a concentration in Human Performance in 1967. Though the first doctoral degree with a major in health had been initiated about twenty years before Indiana's, the growth of programs was very slow until the 1940's so that Indiana made an early contribution in doctoral study in health and safety. Indiana's doctoral degree in recreation was the second to be initiated in the United States for doctoral study in recreation was in its infancy at that time. It was concluded that Indiana University was one of the pioneering institutions in the development of doctoral programs and has had a history of experimental evolution in graduate degree programs in health, physical education and recreation. It was further concluded that similar studies at individual institutions are needed to determine accurately the history of early graduate education to clarify the many discrepancies and conflicting reports found in the existing histories.

Martilu Puthoff
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Brockport, New York 14420

April 3, 1971
3:00 p.m.

SURVEY OF THE ORGANIZATIONAL STRUCTURE OF COLLEGE PROGRAMS IN HEALTH, PHYSICAL EDUCATION AND RECREATION. Dr. Duane B. Mehn, Weber State College.

The results of this summary are based on a questionnaire survey, conducted during the summer of 1970, of the organizational structure at 147 colleges and universities offering a major degree in one or more of the programs of Health, Physical Education and Recreation. The survey was limited to institutions as large, or larger, than Weber State College, i.e., 6,440 full-time-enrolled students. A total of 101 useable replies were received (69.3%). The overall structural unit for the total Health, Physical Education and Recreation program was reported as follows: 6 colleges, 14 schools, 9 divisions, and 72 departments. The most common titles of colleges, schools, divisions, and departments of Health, Physical Education and Recreation is Health, Physical Education and Recreation (44 institutions, 43.6%); Health and Physical Education (18 institutions, 17.8%); and Physical Education (14 institutions, 13.9%). The questionnaire asked what administrator was over the Head of the programs of Health, Physical Education and Recreation. The tabulations indicate that the Health, Physical Education and Recreation program is generally under the Dean of Education (42 institutions, 41.6%); Dean of Arts and Science (10 institutions, 9.9%); and, Academic Vice-President (9 institutions, 8.9%). In most instances (71 institutions, 70.3%) the Women's Physical Education Department is under the Head of the program of Health, Physical Education and Recreation. In 41 institutions (40.6%) the Athletic Director is responsible to the President or Chancellor. In only 18 institutions (17.8%) was the Athletic Director under a Health, Physical Education and Recreation program Head. Forty-seven institutions (46.6%) have undergone some significant change in their organizational structure during the past five years. Finally, the great majority of individuals answering the questionnaire indicate the programs in Health, Physical Education and Recreation should be grouped as a separate unit from other disciplines and operated as an autonomous academic body under the Dean of Instruction, Dean of the College, or a similar administrator.

Dr. Duane B. Mehn, Chairman
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April 3, 1971
3:15 p.m.

PSYCHOLOGICAL EFFECT OF COMPETITIVE WRESTLING*, William P. Morgan, University of Wisconsin, Madison and Willard M. Hammer, University of California, Santa Barbara.

The purpose of this investigation was to evaluate the effect of competitive wrestling on anxiety. The Ss in this investigation were twenty-nine college wrestlers from the University of California at Davis (n = 6), Riverside (n = 8), San Diego (n = 7), and Santa Barbara (n = 8). Form A of the IPAT 8-Parallel-Form Anxiety Battery was administered to each wrestler in early season; Form B was administered following their weigh-in at the All-California Tournament (four hours before competition); Form C was administered one hour before the tournament started; and Form D was administered between 15 and 30 minutes following the tournament. The data were analyzed with a repeated measures ANOVA for multifactor experiments. The F ratio for teams was 0.942 ($P>.05$) indicating that the four teams did not differ throughout the investigation. The F ratio for conditions was 3.13 ($P<.05$) which indicated that the mean anxiety level shifted significantly as a function of time. The interaction F ratio was 0.42 ($P>.05$). Comparisons of mean anxiety scores with the Newman-Keuls method reavealed that anxiety increased significantly in the pre-match setting. Also, post-match anxiety was significantly lower than the pre-season, weigh-in, or pre-match anxiety levels. It was concluded that anticipation of competition was associated with an increase in anxiety, whereas the competition per se was associated with a reduction in anxiety below "control" levels.

*This investigation was conducted while WPM was supported by a USOE Post-doctoral Fellowship, Institute of Environmental Stress, University of California, Santa Barbara. The investigation was also supported by University of California faculty research grant #3-336 to WMH.

William P. Morgan
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April 3, 1971
3:30 p.m.

INTERNAL-EXTERNAL CONTROL AND SOCIAL REINFORCEMENT EFFECTS ON MOTOR PERFORMANCE. Rainer Martens, University of Illinois at Champaign-Urbana.

The effect of praise and reproof as social reinforcers on the performance of qualitative motor responses among young boys high in internal control as compared to boys high in external control was determined. Internal control refers to individuals who have a strong expectancy that reinforcements are a consequence of one's own actions and thereby under personal control. External control refers to individuals characterized as having a strong expectancy that reinforcements are unrelated to one's own behaviors in certain situations and therefore beyond personal control. Thirty internal control and 30 external control Ss, as selected by the Bialer Locus of Control Scale, were randomly assigned into a praise, reproof, or control group. Praise and reproof were administered on a contingency basis. The motor task involved rolling a ball up an inclined board to a target area.

The data were analyzed in a 2 X 3 X 8 factorial design with 8 blocks of five trials each as the repeated measures factor. Analysis of variance and covariance were the statistical methods applied. The results failed to support the hypothesis that social reinforcement differentially affects the motor performance of internal control Ss as compared with external control Ss. The results were discussed in relation to social learning theory and previous research. An attempt was made to show that the apparently equivocal literature contains some consistency when distinguishing between qualitative and quantitative motor responses and between learning and performance.

Supported by USPHS grant MH-07346 and DMH grant 9424.

Rainer Martens
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April 3, 1971
3:45 p.m.

THE INFLUENCE OF TRAIT AND STATE ANXIETY UPON PERFORMANCE OF A NOVEL GROSS MOTOR TASK UNDER CONDITIONS OF COMPETITION AND AUDIENCE. Robert L. Slevin, Towson State College.

The main purpose of this study was to analyze the effects of trait and state-anxiety upon performance of a novel motor task requiring speed and accuracy under four experimental conditions involving competition and presence of audience. Secondary purpose was to determine relationships among trait-anxiety scores, state-anxiety scores and performance task scores. Based on scores on the STAI A-Trait Anxiety Scale two groups of male high-school subjects were formed: a high-trait-anxiety group and a low-trait-anxiety group. Subjects executed a modified fencing lunge and recovery task requiring speed and accuracy in a thirty second time period. Using a counter-balanced schedule of the following experimental conditions: Absence of competition and absence of audience; Absence of competition and presence of audience; Presence of competition and absence of audience; Presence of competition and presence of audience. A completely randomized two-by-two split-plot factorial analysis of variance compared the state-anxiety scores and performance task scores. Pearson product moment correlation coefficients computed relationships among trait-anxiety scores, state-anxiety scores and performance task scores. Findings of this study were: 1) The high-trait anxiety group responded with significantly higher state-anxiety scores throughout the four experimental conditions than the low-trait anxiety group. 2) Low-trait anxiety group performed significantly better under all the different experimental conditions than the high-trait anxiety group. 3) Performing in absence of audience brought about higher state-anxiety prior to performance than the conditions with presence of audience. 4) Competition did not produce higher state-anxiety prior to performance than absence of competition; however, presence of competition rusulted in significantly better performance task scores. 5) A significant interaction was found between effects of competition and effects of audience on performance task scores in that the superiority of competition over no-competition was much greater under the conditions of no-audience than when performing in the presence of an audience. 6) A significant relationship was found between trait-anxiety and state-anxiety. Generally, a significant negative relationship was evidenced between trait-anxiety and performance. Within the limits of this study the following conclusions were justified: 1) High-trait anxious persons perform more poorly than low-trait anxious persons on novel gross motor tasks. 2) Competition results in better performance than no competition. 3) Trait-anxiety is related to state-anxiety and although state-anxiety varies under different performance conditions the same general relationship between trait and state-anxiety exists.

Dr. Robert L. Slevin
Associate Professor
Physical Education
Towson State College

April 3, 1971
4:00 p.m.

RELATIONSHIP OF MOTOR PERFORMANCE AND FIELD INDEPENDENCE AS MEASURED BY THE ROD AND FRAME TEST. Vera Skubic, Univ. of California; Frances Meek, Oxnard High School, Oxnard, Calif.

Purpose: The purpose of the study was to determine (1)whether highly skilled girls are more reliant on self-awareness for their sense of the upright than are poorly skilled girls and (2) whether the personality trait of independence is related to field independence as measured by the rod and frame test.

Method: Cattell's High School Personality Questionnaire and Witkin's Rod and Frame Test were administered to 60 high school girls between the ages of 14 and 16. Thirty of these girls were highly skilled performers and thirty were poorly skilled.

On the first day of testing, subjects were given nine trials of the Rod and Frame Test. There were three different frame positions and for each of these, there were three different rod positions. Only the rod and frame were visible to the subjects. It was the subject's task to attempt to adjust the rod to the upright position by using a remote control switch. On the second day of testing, the Cattell Personality Test was administered.

Results: The highly skilled girls did not differ significantly from the poorly skilled girls on the Cattell Test. The personality trait of independence appeared to be different from the rod and frame factor of field independence as measured in this experiment.

The highly skilled girls were more accurate in perceiving the vertical than were poorly skilled subjects. The skilled group was field independent since they were able to ignore the frame and instead relied on the kinesthetic sense in making judgments of the upright position. The poorly skilled girls relied heavily on environmental supports, which in this case were unreliable, resulting in larger errors in judgment.

Dr. Vera Skubic, Dept. of Ergonomics & Physical Education, University of California, Santa Barbara

April 3, 1971
4:15 p.m.

AN ANALYSIS OF MILITARY OFFICER TRAINING CADETS AS TO RELATIONSHIP OF DEGREE OF PHYSICAL FITNESS TO PERSONALITY STRUCTURE.

Philip K. Wilson, Wisconsin State University-La Crosse;
James G. Blaney, Wisconsin Military Academy.

The purpose of this study was to determine the relationship between the degree of developed physical fitness to the personality structure of young adult military acceptable males. The subjects consisted of the fifty-two members of the 1970 Cadet Class of the Wisconsin Military Academy. The subjects were administered the Guilford Zimmerman Temperament Survey to determine individual personality structure. The United States Physical Combat Proficiency Test was given to the subjects as a method of determining individual levels of developed physical fitness. A total "composite score" for each subject was determined, based upon the individual items of the Combat Proficiency Test, and was utilized as the indicator of the level of developed physical fitness. Bivariate statistical techniques were utilized in the analysis of the collected data. Relationships were determined between the "composite" Combat Proficiency Test Score and the personality structure data. Relationships were also determined between collected data relative to the individual personality adjustment items. The one percent level of confidence was the critical value throughout the statistical analysis. The results of the study indicated that there was no relationship between levels of developed physical fitness, as determined by the "composite score" on the United States Physical Combat Proficiency Test, and individual personality structure, as determined by the Guilford Zimmerman Temperament Survey. However, there were significant statistical relationships between individual Combat Proficiency Test item data and collected personality adjustment factor data.

Philip K. Wilson
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April 3, 1971
4:30 p.m.

CHANGES IN SELECTED TRAITS OF FRESHMAN WOMEN COLLEGE STUDENTS AFTER PARTICIPATION IN A SELF-DEVELOPMENT PROGRAM.* Amilda Thomas, Pan American College.

The purpose of this study was to determine the differences between participation and non-participation in a planned program of Self-Development in terms of changes in the selected traits of general information, temperament, expressed attitudes toward teacher-pupil relationships, expressed interests characteristic of women in physical education, vocabulary, reading comprehension, and reading rate. The data were collected from two administrations of a battery of tests designed to measure the selected traits of forty-six women enrolled as freshman major students in the College of Health, Physical Education, and Recreation of the Texas Woman's University at Denton, Texas, during the academic year of 1968-1969. After the initial administration of the battery of tests, each of the subjects was assigned randomly to either a control group (N=23) or to an experimental group (N=23). The experimental group participated in a Program of Self-Development designed to stimulate them toward self-improvement in the selected traits whereas the control group followed the regular regime of the College and University. At the end of the experimental period comprised of six months, the battery of tests was re-administered to the subjects in both the control and experimental groups. The analysis of variance technique was utilized to determine the significance of differences between the experimental group and the control group in each of the twenty-one dependent variables on both the initial and final administrations of the battery of tests. Results of the study indicated that the subjects who participated in the planned Program of Self-Development were better informed in the areas of literature and drama ($p>.025$) and of sports ($p>.05$)--two of the six areas in Duggan's General Information Test--and possessed better reading comprehension ($p>.05$) -- one of the three traits measured by The Nelson-Denny Test -- than the subjects who did not participate in the planned Program of Self-Development. No significant differences were found between the initial and final administrations of the following tests: The Guilford-Zimmerman Temperament Survey, Minnesota Teacher Attitude Inventory, Strong Vocational Interest Blank, and the Nelson-Denny Reading Test in the traits of vocabulary and of reading rate.

*A doctoral dissertation completed at Texas Woman's University under the direction of Anne Schley Duggan

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April 3, 1971
4:45 p.m.

ATTITUDES TOWARD TEACHING LOW SKILLED AND LOW FIT STUDENTS AMONG MALE PHYSICAL EDUCATION MAJORS. Donald R. Hellison, Portland State University.

Purpose. This study had two purposes: to develop an instrument which will measure attitude toward teaching low skilled/low fit students; and to determine the characteristics of the male physical education major who holds a positive attitude toward teaching low skilled/low fit students.
Procedure. Scores for fifteen variables were obtained from 121 male physical education majors at Portland State University (about 83 per cent of all male majors). From these scores, 65 zero-order correlation coefficients were computed.
Findings. Three instruments designed to measure attitude toward low skilled/low fit students were developed, using several different methods to determine validity. In their final form, these three instruments correlated to some extent with each other (.36, .41, .61). All three instruments correlated positively and significantly with self-esteem, progressive attitude toward education, age, and class in school. Two of the instruments correlated positively and significantly with consistency of attitude toward education, and one instrument correlated negatively with dogmatism (positive attitude-low dogmatism). Such variables as physical skill rating by faculty, grade point, traditional attitude toward education, and socio-economic status were not related to attitude toward teaching low skilled/low fit students.

Donald R. Hellison
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April 3, 1971
5:00 p.m.

RELATIONSHIPS BETWEEN BODY IMAGE BOUNDARY, BODY SPATIAL IMAGE, AND MOVEMENT PERFORMANCE IN EARLY ADOLESCENT SUBJECTS.*

Wilhelmina D. McFee, Sam Houston State University.

The purpose of this study was to determine the relations between body image boundary, body spatial image, and movement performance in early adolescent subjects in order to give a more complete picture of relations of these variables for ages eight to twenty years. The evidence of a previous study indicated that developmental patterns were to be expected in the relations of the variables of this study, and the variables would have mutually reciprocal relationships. (Marcella D. Woods. Unpublished Ph.D. Dissertation, The Ohio State University, 1967) The interpretation of data was by means of linear correlation, and the significance of the degree of relationship tested the statistical hypothesis that $\rho = 0$. One hundred subjects from a junior high school and a senior high school in Columbus, Ohio participated in the study. A total of sixty-eight boys and girls aged 14 and 16 years completed all tests. Body image boundary was measured by the Holtzman Inkblot Technique scored for Barrier Score. Body spatial image was measured by the modified Popper height estimation method and a grid method of estimating body spatial dimensions. Movement performance was measured by the Scott-French Three-Item Motor Ability Test and the Woods' motor tasks including catch-throw, target jump, and shuttle run. The findings suggest: there are mutually reciprocal relations between indices of body image boundary and movement performance; the body spatial image utilizing the two methods may consist of at least three factors characterized as vertical, horizontal, and extension; the Popper and grid methods of evaluating body spatial image appear to complement each other in clarifying relations of body spatial image, movement performance and body image boundary; the developmental trends suggested by previous studies were in general supported by this study; the trends were toward an overestimation but with increasing accuracy in representing the dimensions of body space, toward improved movement performance with increased sex differences, and toward a higher Barrier Score. The results are promising in terms of implications for future study and in theorizing about the meaning of movement experiences from the view of the body image.

*This research was supported in part by a grant from the College of Education, and by release time from the Women's Division, School of Health and Physical Education of The Ohio State University.

Wilhelmina D. McFee
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April 3, 1971
5:15 p.m.

SKY DIVING AND HUMAN REVOLT: A PHENOMENOLOGICAL DESCRIPTION.

William A. Harper, Kansas State Teachers College of Emporia

Purpose of Study: Man is confronted daily with the puzzle of his existence, in the face of which many differing stances can be assumed. Perhaps the most common positions taken make up some kind of rejections of or escape from this mystery, but an alternative posture remains for man, namely, revolt. It was the purpose of this investigation to attempt to describe the essential structures of the act of human revolt as they were given in the sport of sky diving.

Procedures: The method used in the conduct of this investigation was transcendental phenomenology after Edmund Husserl. Phenomenology is the grounded and grounding pure science of essences, with the region of investigation being Consciousness and the Universals given or intended in it (life-world), rather than the natural world of individual objects located spatiotemporally and come upon in sense experience, i.e., perceived, smelled, heard (world-life). Because of the intentionality of Consciousness (Consciousness is to be the Consciousness "of" something or other) and the existence of Universals which are rendered present in Consciousness, Husserl believed it possible to reach objective knowledge by reflecting upon our experience and describing faithfully what appears in a direct grasp of evident truth.

Conclusions: Upon examination of the essential structures of human revolt as they may be found in the sport of sky diving, it was seen that the absurd, hope and death are inextricably bound up with the idea of revolt. Reflection revealed that in order to revolt one must recognize the absurd situation of man in that at present he has great difficulty making much sense out of either himself or his world. Also it was seen that necessary to revolt is a profound hope which is characterized by being open to one's experiences and by which man can define himself more fully. And finally that revolt is a protest against the irrevocable and necessary fact that "I will die." In summary, revolt is an accentuation of the absurd, a proclamation of hope and a confrontation with death.

William A. Harper
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April 3, 1971
5:30 p.m.

THE RELATIONSHIP BETWEEN THE PERCENTAGE OF BUCCAL CELL NUCLEI CONTAINING BARR BODIES AND THE PSYCHOLOGICAL MASCULINITY-FEMININITY INDICES OF COLLEGE WOMEN

Joan E. Bottger Texas Woman's University

The purpose of the study was to determine the relationship between the percentage of buccal cell nuclei containing Barr bodies and the psychological masculinity-femininity indices of college women. The subjects consisted of 100 freshman and sophomore college women enrolled in body mechanics classes at the Texas Women's University during the spring semester of the 1968-1969 academic year. Psychological masculinity-femininity was assessed by the M scale of the Guilford-Zimmerman Temperament Survey, the Mf scale of the Minnesota Multiphasic Personality Inventory, and a composite score obtained from the two scales. The percentage of cell nuclei containing Barr bodies was determined by subjecting buccal smear samples to the modified Guard sex chromatin staining technique. A 100 cell microscopy analysis was conducted for each subject at an immersion oil magnification of 970 diameters. The results of the buccal smear test were recorded in relation to the total percentage of cells noted to contain sex chromatin and the central or peripheral nuclear location of the chromatin masses. Significant correlations were not obtained between the central, peripheral, or total sex chromatin assessments when compared with the M scale of the GZTS or with the composite scale of femininity. A significant relationship ($P < .05$) was obtained between the results of the Mf scale of the MMPI and the total percentage of sex chromatin positive cells. The low (+.21) correlation and the lack of correspondence between either the percentage of central or peripheral sex chromatin positive cells with the Mf scale suggests the possibility that the significance of the correlation may have been due to a type I statistical error. The results of the study failed to substantiate a definable relationship between the percentage of buccal cell nuclei containing Barr bodies and the psychological masculinity-femininity indices of college women.

Dr. Joan E. Bottger
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April 4, 1971
2:00 p.m.

PERFORMANCE VARIATIONS ASSOCIATED WITH THE MENSTRUAL CYCLE.* T. L. Doolittle, University of Washington; Louella Lipson, Carpenteria, California.

The purpose of this study was to further elucidate the influence of the menstrual cycle on female performance. Eight women, 21-25 years of age, free of menstrual disorders and not using oral contraceptives, completed the study. Performance in the 1.5 mile run-walk was assessed 9-12 times during a 35 day period. Although the starting points in their cycles varied, the 35 days spanned at least one complete menstrual cycle in all cases. The Ss performed at 3-4 day intervals; in addition, measures were obtained within 24 hours after the onset of menses (Day 1) for 6 Ss and within 48 hours (Day 2) for the remaining 2. Variations in the length of cycles were adjusted so that analysis could be conducted in terms of cyclic phases. Day of ovulation (EO) was estimated. Mid-Follicular (MF) and Mid-Luteal (ML) points were established as the median between the onset of menses and EO, and between EO and the onset of subsequent menses, respectively. Intervening measures were equated in a similar manner. The data were plotted for each S with respect to cyclic phases and in the order of testing. When only 4 values were plotted (menses, MF, EO and ML) a consistent (7 of 8 Ss) drop in performance appeared to occur between menses and MF with a reversal (6 of 7 Ss) between MF and EO; however, the inclusion of the intermediate values obliterated these apparent consistencies. In addition, ANOVA for the performance measures across all the cyclic phases resulted in a statistically insignificant F ratio (.296) and acceptance of the null hypothesis: that any differences in performance means through-out the menstrual cycle were due to random sampling error or chance. The observation that more frequent measurement obliterated the otherwise apparent variations was deemed to be of importance for designing future studies investigating cyclic variability. An additional analysis, utilizing Wilcoxon's Matched-Pairs technique, revealed no statistically significant difference between the first and last performance measures (phase of cycle disregarded). This unexpected finding indicated that the activity involved (1.5 mile run twice a week) was insufficient to bring about a significant training effect. The primary findings of this investigation support those of many previous investigators and favor the neoteric theory regarding performance during the menstrual cycle; thus, it was concluded that the female is as fit for near maximal performance during menses as she is during any other phase of her cycle.

*Supported in part by a Faculty Research Grant from the CSCLA Foundation, prior to Dr. Doolittle's move to Washington.

T. L. Doolittle
Physical Education Dept
University of Washington

April 4, 1971
2:15 p.m.

THE EFFECT OF THE MENSTRUAL CYCLE ON TASK PERFORMANCE UNDER DIFFERENT STRESSFUL CONDITIONS. Madge M. Phillips, Washington State University.*

The purpose of this study was to ascertain if there were cyclic variations in task performance (neuromuscular hand control or steadiness and reaction time to a visual and an auditory stimulus) which could be attributed to the menstrual cycle and if the type of stress under which subjects were tested would affect the ability to perform these tasks. Subjects were members of intercollegiate varsity athletic teams who had no history of dysmenorrhea. A randomized complete block design was used so that each subject was tested under six different stressful conditions (before and after a typical or regular academic class period; before and after a mid-term or hour exam; and before and after participating in an intercollegiate varsity athletic event) during each of three phases of the menstrual cycle (pre-flow, flow and resting). The obtained data of the measurements of steadiness, reaction time to a visual stimulus and reaction time to an auditory stimulus were analyzed separately. The three separate analyses were 3x3x2 factorial experiments. A two-way classification analysis of variance statistical technique was used. The results suggested that the type of stress an individual experiences is as an important consideration as the phase of the menstrual cycle in understanding fluctuations in task performance. Steadiness scores were higher (less steady) during the pre-flow phase of the cycle. Women appear to have higher steadiness scores (less steady) before participating in athletic events than after the events, especially during the pre-menstrual period. The stress of an examination appears to be greater than the stress of an intercollegiate varsity athletic contest. For college women in this study, it does appear that the type of stress under which the task is performed is as important as the phase in the menstrual cycle in determining task performance ability.

*This investigation was supported in part by funds provided for biological and medical research by the State of Washington Initiative Measure No. 171.

Madge M. Phillips
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April 4, 1971
2:30 p.m.

HEART RATE AND ESTIMATED OXYGEN CONSUMPTION DURING WOMEN'S COMPETITIVE BASKETBALL. William D. McArdle, John R. Magel and Lucille Kyvallos, Queens College.

In the present study the relative strenuousness of women's competitive basketball was evaluated in six members of the Queens College women's basketball team by use of the telemetered heart rate. Heart rates were obtained on each subject for at least one quarter during regularly scheduled games. Estimates of energy expenditure were obtained by applying each subject's activity heart rate to her heart rate-oxygen uptake line established in the laboratory. Since the rules of women's basketball are in a state of change, measurements were obtained in both 5- and 6-player competition. In addition, changes in aerobic capacity over the season were evaluated by use of the maximum oxygen uptake test. It was concluded: 1) The mean changes in body weight, $\dot{V}O_{2\ max}$, and maximum heart rate during the basketball season were not statistically significant. 2) Under playing conditions (actual play, out-of-bounds and foul shots) the average heart rates ranged from 154 beats/min in a guard in a 6-player game to 195 beats/min in a rover in a 6-player game. 3) Estimated average oxygen consumption during playing time ranged from a low of 1.48 $l O_2$/min to a high of 2.44 $l O_2$/min. This represented a range of average caloric expenditure of 7.1 to 11.8 Cal/min, respectively.

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April 4, 1971
2:45 p.m.

A COMPARISON OF THE ENERG XPENDITURE DURING POSITIVE AND NEGATIVE GRADE RUNNING. Robert J. Gregor, Ball State University; David L. Costill, Ball State University.

The purpose of this study was to compare the energy expenditure during positive and negative grade running. This comparison was expressed as a ratio utilizing net percent difference from the horizontal for both downgrade and upgrade values (ml/kg-min). A group of ten highly conditioned runners was tested on three separate treadmill runs utilizing a +6% grade, 0% grade, and a -6% grade. All runs were of a seven minute duration at an average speed of 200 m/min. Variables measured were heart rate, oxygen consumption, leg length, stride length, and step frequency. It was found that the fractional utilization of the aerobic capacity varied from 44% (-6% grade) to 78% (+6% grade). Energy requirements increased 40% (+6% grade) and decreased 27% (-6% grade) from horizontal values. The resultant positive:negative work ration was 1.92:1. Correlations among variables fluctuated from slight to moderate with the most significant being a high positive correlation between energy expenditure and step frequency. It can be concluded that within the limitations of this investigation positive work costs approximately twice as much as negative work.

Robert J. Gregor
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April 4, 1971
3:00 p.m.

The Relationship Between Selected Measures of Pulmonary Function and Cardiovascular Fitness, John M. Kelly, St. Cloud State College; Wayne E. Sinning, Springfield College.

The purpose of this investigation was to study the relationships between selected pulmonary function measurements and cardiovascular fitness as measured by the maximum oxygen uptake test. Ten dimensional and eleven functional lung measurements were taken on 35 male subjects ranging between 20 and 30 years of age. Dimensional measurements were: TV, ERV, IRV, IC, VC, FRC, RV, RLC, RV/TLC. Dynamic measurements were: FVC, FEV 0.5, $FEV_{1.0}$, FEV % of FVC (both at 0.5 and 1.0 sec) MMF, MVV_{80}, and maximum $\dot{V}_E$ and ventilatory equivalent at maximum $\dot{V}_{O2}$. Maximum $\dot{V}_{O2}$ was measured by use of a progressive bicycle ergometer test. Age, height, weight and B.S.A. were used with these measurements in the computation of 350 product-moment and 253 partial correlations as well as multiple correlations and regression equations. Obtained correlations and intercorrelations were generally smaller than those reported by other investigators, apparently due to the greater homogeneity of the sample. Findings were as follows: 1. Maximum $\dot{V}_E$ was highly related to maximum $\dot{V}_{O2}$ ($\underline{r}$ = .53); 2. Dimensional lung measurements were not related to maximum $\dot{V}_{O2}$; 3. $FEV_{1.0}$ had a significant correlation with maximum $\dot{V}_{O2}$, ($\underline{r}$ = .46) but it was too low for use in a predictive equation, and 4. No combination of functional and dimensional measurements provided a useful regression equation for the prediction of maximum $\dot{V}_{O2}$. In conclusion, pulmonary function or lung dimensions are not factors which limit the maximum $\dot{V}_{O2}$ in young, healthy adult males. Such measurements appear to have little if any value when assessing cardiovascular fitness in such subjects.

John M. Kelly
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April 4, 1971
3:15 p.m.

VALIDITY OF THE 180 HEART RATE TERMINATION IN ASSESSMENT OF AEROBIC CAPACITY IN YOUNG WOMEN BY PROGRESSIVE TREADMILL EXERCISE. L. Dennis Humphrey; Harold B. Falls, Southwest Missouri State College.

The purpose of the study was to determine whether the 180 heart rate termination commonly used in the Balke Test is valid when testing the maximum aerobic capacity of young college women. V_{O_2} was determined for 15 young college women during Balke Test exercise at two exercise heart rates: 180 ($\bar{x}$ = 182) and maximum ($\bar{x}$ = 193). Heart rates were determined from a bipolar chest lead EKG recorded on a physiograph. Expired air was collected in Douglas Bags, and the volume was determined by evacuating the air through a dry gas meter. O_2 and CO_2 percentages were determined by utilizing a Godart analyzer which was calibrated against a micro-Scholander and Gallenkamp-Lloyd apparatus. When the heart rate neared 180, one minute collections of expired air were initiated and continued until the subject terminated the exercise. Douglas Bags containing expired air for minutes corresponding to the 180 heart rate and the final minute of the Balke Test were analyzed. Each girl was tested at least three times and the results were averaged. The t test for correlated samples was utilized to determine if the values for V_{O_2} STPD (liters), V_{O_2} STPD (ml/kg/min), V_E BTPS (liters), R. Q., and duration of the test in minutes obtained for the maximum heart rate were greater than the values obtained for the 180 heart rate at the .05 level of significance. All t test values were significant. Mean results obtained were:

	180 H.R.	Maximum H.R.	Difference
VO_2 STPD (liters)	1.91	2.19	0.28
V_{O_2} STPD (ml/kg/min)	33.58	38.53	4.95
V_E BTPS (liters)	68.69	91.01	22.32
R. Q.	0.95	1.02	0.07
Test Duration (min)	13.50	16.70	3.20

If the objective when applying the progressive treadmill test to young college women is to determine the maximum aerobic capacity, a heart rate cutoff point in excess of 190 should be used instead of the commonly utilized value of 180. Otherwise, the maximum V_{O_2} may be underestimated by an average of 13%.

L. Dennis Humphrey
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April 4, 1971
3:30 p.m.

VALIDITY OF THE PALPATION TECHNIQUE OF HEART RATE DETERMINATION AND ITS ESTIMATION OF TRAINING HEART RATE. Michael L. Pollock, Jeffery Broida, Zebulon Kendrick, Wake Forest University.

This investigation's purpose was twofold: 1.) if adult men in the course of actual training could accurately count their post exercise heart rate, 2.) compare post exercise heart rate estimation with values determined during running. Thirty-eight men (30 to 45 years of age) volunteered for this investigation. Prior to data collection, the palpation technique of counting the carotid or apical pulse for 10 sec. was practiced eight times. Subjects then ran at a steady state heart rate of either 80 or 90% of maximum. Subjects trained on a quarter mile track with heart rates being counted after a ½ to 2 mile run. They counted their heart rate within 12 to 14 seconds after stopping in front of a clock with a large sweep hand. Heart rates were also monitored via biotelemetry (Parks) and EKG recording (Sanborn) systems, and recorded to the nearest ½ beat. Care was taken to insure that both subjects and investigators had no knowledge of either's results until after data were recorded. In 252 trials, the error in estimating running heart rate via biotelemetry (171.0 beats/min.) versus post exercise count by subjects (169.4 beats/min.) was 1.0%. Post exercise values via biotelemetry and subject count (170.1 vs. 169.4 beats/min.) showed a 0.5% difference. When trials at 90% of maximal heart rate (n=142) were compared to 80% (n=110) no significant differences were noted. Values for the 90% group were telemetered at 174.0 beats/min. while running, and 172.4 beats/min. while stopped as compared to 166.9 and 165.4 beats/min. for the 80% group. Conclusions were a.) training heart rates of 80 to 90% magnitude can be accurately estimated during recovery (beats/10 sec.) and b.) the palpation technique for estimating heart rate can be adequately determined by adult men while training.

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April 4, 1971
3:45 p.m.

RELIABILITY AND INDIVIDUAL DIFFERENCES IN ENDURANCE PERFORMANCE.

Victor L. Katch, University of California at Berkeley.

Individual differences and reliability in heavy work endurance were determined in 34 male high school students. A bicycle ergometer was pedalled for 10 minutes at a constant friction load of 21 kpm/rev on two different occasions. The initial cadence was set at 72 rpm's resulting in a work rate of 1512 kpm/min. The friction remained constant while pedalling rate declined as fatigue developed, thus the total work done was directly proportional to endurance. The average amount of total work was 11,649 kpm's (S=548) for Test I and II,742 kpm's (S = 614) for Test II. The average work decrement (drop-off from min 1 to 10) was 17.5%. The test-retest reliability for total cumulated work was $\underline{r}$ = .87. Beginning with minute 2 there was a progressive increase of 420% in individual differences (S_t), and a much smaller (55%) increase in the intravariance. In consequence, the internal reliability (adjacent min $\underline{r}$) increased from $\underline{r}$= .58 at minute 2 to .76 at minute 4 and changed very little thereafter. Similar reliabilities were found for the drop-off scores. Using the total work done in Test II as a criterion of endurance the validity coefficients for single minute scores were negative and/or non-significant for the first 3 minutes, $\underline{r}$= .60 for min. 4 and .70 at min. 5; thereafter the correlation was approximately $\underline{r}$=.80. Due to the ineffectiveness of the first 3 minutes, the min-by-min cumulated work scores were less effective than single minute scores through minute 7. They were, however, more effective thereafter. Drop-off scores were 12 percent less effective. Total work correlated r=.18 with body weight and r = -.18 with age in this sample.

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April 4, 1971
4:00 p.m.

COMPARISON OF A STEADY STATE EXERCISE BASELINE TO A RESTING BASELINE IN DETERMINING OXYGEN DEBT.

J. J. Zimmermann, Connecticut College; Paul M. Ribisl, Kent State University.

Introduction. Traditionally the oxygen debt has been measured as the oxygen used in recovery that is in excess of a resting baseline of oxygen uptake. Some recent research has shown that recovery is more accurate and rapid when recovery is made to a baseline of mild, steady state exercise rather than to a resting baseline. Purpose. The purpose of the study was to compare two common methods of measuring oxygen debt with special reference to accuracy and measurement time. Procedure. Baseline values were established in a ten minute period prior to exercise. Oxygen uptakes were measured on ten young males who then rode a bicycle ergometer for five minutes at a near maximal work load (1500 kpm/m). The subjects recovered for 20 minutes to either a resting baseline or a baseline of mild, steady state exercise (300 kpm/m). Both tests were repeated for reliability and the results were treated with a two-way analysis of variance on repeated measures. Results. No significant differences were obtained on the repeat trials of either method indicating that the tests were reliable. In comparison to the resting baseline test it was found that the steady-state test showed: 1-a significantly higher net oxygen uptake during the five minute work period. (+0.958 Liters) 2-a non-significant but higher net oxygen debt after exercise. (+0.426 Liters) 3-a non-significant but higher net oxygen requirement for the task. (+1.384 Liters) 4-a non-significant but slower recovery back to the baseline as evidenced by a larger error above the baseline. (+0.137 Liters/min). Conclusion. It was concluded that neither method showed a significant advantage over the other in terms of accuracy or time of measurement of the oxygen debt.

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April 4, 1971
4:15 p.m.

PREDICTING PHYSICAL WORKING CAPACITY OF CHILDREN FROM RUNNING PERFORMANCES.[1] Charles B. Corbin, Texas A&M University

It was the purpose of this study to: (1) determine the validity of field tests (200, 400, 600, and 800 yard runs) as measures of Physical Working Capacity (PWC) for intermediate elementary school children, (2) determine the PWC of children of different ages in intermediate elementary school, and (3) determine the extent to which PWC can be predicted from running performance. Subjects for the investigation were sixty-four boys, sixteen from each elementary school grade 3-6. The boys were selected from a group volunteering from the College Station, Texas Public Schools. Subjects were selected on the basis of 600 yard running scores in attempt to select subjects of all fitness levels. Heart rates and performance times were determined during runs of 200, 400, 600, and 800 yards using radio biotelemetry equipment. In addition the PWC of each subject was assessed using the method of Sjostrand and Wahlund. Performance times for each run were correlated to PWC scores. Regression equations were also determined. PWC scores of the children tested compared favorably with those reported for Swedish, Californian, and Canadian children. The PWC bicycle test was the only test to discriminate between children of all different age groups. Heart rates at the end of running performance time for the 200 yard run discriminated most effectively between age groups. Like previous studies, the results of this study indicate that age is more significant a factor in determining working capacity than other variables. Heart rates and performance times added little to the predictability of PWC when age was considered. While there were significant relationships between running times and PWC, the partialing out of age and other factors reduced these relationships to the point where only running time for the 200 yard run was significantly related to PWC (.05 level of significance). It seems that running performance including the 200 yard run, are not good predictors of PWC for children.

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[1] Research supported by the Research Council of Texas A&M University.

Charles B. Corbin
Department of Health & Physical Ed.
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College Station, Texas

April 4, 1971
4:30 p.m.

THE EFFECTS OF A 12 WEEK JOGGING PROGRAM UPON SELECTED MEASURES OF CARDIOVASCULAR FITNESS IN MIDDLE-AGED MEN

Paul S. Fardy

There has been considerable interest of late in the value of jogging as a means of improving adult cardiovascular fitness. The simplicity of jogging makes it particularly attractive when compared to those activities requiring skill proficiency and necessitating at least a minimum of equipment. The purpose of this study is to measure the effects of a twelve week, three day a week program of jogging. Of primary concern is the cardiovascular adaptation derived from such a training regime. Eight male subjects between 42 and 53 years of age volunteered for the program. The training consisted of a gradual progression of walking and jogging from 1/2 mile per day at the onset to a total of two miles per day at the program's conclusion. The subjects were tested at the beginning and again at the end of twelve weeks. Each subject was first tested between 6:00 and 8:00 A.M. in a resting post-absorptive condition. An E & M Physiograph Six multi-channel recorder, with a paper speed of 50 mm per second, was utilized for simultaneous recordings of the radial pulse wave, phonocardiogram, and electrocardiogram. Lead I used as a precordial lead of the EKG was adopted. The points of contact were midway between the wrist and elbow for the indifferent electrode, and beneath the apex of the heart for the exploring electrode. A crystal microphone was used for picking up heart sounds, and a photoelectric pulse pick-up was utilized for the radial pulse wave. An elastic strap was employed in order to obtain a firm contact. An average of five cycles was taken. Significant changes were noted in several measures. These included: Electro Mechanical Lag (rest); Total Systole (1' post ex.); Diastole (2' post ex.); Heart Rate (1' post ex.); Rest/Work (2' post ex.); Step Test-2 min. Recovery Heart Rate (18 steps/min.); Step Test (24 steps/min.); Systolic Blood Pressure (Sitting); Systolic Blood Pressure (Standing); Body Weight, Abdominal Fat Fold, Rear Thigh Fat Fold, Front Thigh Fat Fold. The findings of this investigation give additional support to the hypothesis that long term endurance activity has a positive effect on cardiovascular fitness. The most beneficial amount and intensity of the work remains a question, although it appears that three days a week over a 12 week period will bring about some such significant changes.

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April 4, 1971
4:45 p.m.

CONDITIONING OF HEART RATE UNDER EXERCISE STRESS. Nancy J. Mize, Kansas State College of Pittsburg.

Thirty college women at the Texas Woman's University, Denton, Texas, were equally divided into two groups, one experimental and one control, to determine if heart rate could be instrumentally conditioned and controlled during exercise stress upon the bicycle ergometer. The two groups were equated upon the basis of mean resting heart rate and the results of a SWC_{150} test administered during the pre-test period. The experimental subjects received conditioning with immediate visual and verbal feedback and reinforcement of the conditioned response. The conditioning sessions for the experimental group were thirty minutes in duration meeting daily for a maximum of twelve days, depending upon the subject's rate of learning. A resting heart rate was established from a sitting position for each subject at the beginning of each experimental session. This rate was determined by measuring the last ten heart beats in each of the last three minutes of the ten minute stabilization period, provided at the beginning of each experimental session. A mean heart rate was established for each day upon the basis of these selected thirty heart beats. A ten per cent decrement of the subject's mean resting heart rate upon command was considered at the level of acceptability for heart rate slowing while sitting and under exercise stress. The criterion for learning in this study required the subject to lower her heart rate significantly three of the four trials presented each day, for two consecutive days, while in the resting position. Upon learning, each experimental subject and a randomly selected control subject were given the SWC_{150} test to determine if control could be exhibited under exercise stress. An analysis of variance technique was selected to test the significance of the differences between the two groups in their ability to control the heart rate under exercise stress. It was concluded that instrumental conditioning during the resting state appears to facilitate heart rate lowering in the exercise stress situation measured, but to a statistically significant degree. This trend was apparent and the data were significant at low intensities of exercise for the subjects who met the criterion measure of learning.

Nancy J. Mize
Kansas State College
Pittsburg, Kansas 66762

April 4, 1971
5:00 p.m.

THE INCIDENCE OF INJURY AMONG WOMEN PARTICIPATING IN NATIONAL BASKETBALL AND TRACK AND FIELD AND TEXAS STATE TENNIS COMPETITION DURING 1969. Linda J. Hammett, The Texas Womans University.

The study endeavored to determine the actual number of injuries in each sport, to determine the percentage of each type of injury in relation to the number of participants and the number of reported injuries in each sport, and to isolate the most frequent injury in relation to the sport and the anatomical area of the body. An Analysis of Injury Chart was constructed for the collection of data used in the investigation. The teams were selected for participation in the study in the specific sports tournaments and the charts distributed to each of the participants. The selected tournaments included the National Invitational Basketball Tournament, the Womens National AAU Basketball Championships, the DGWS National Intercollegate Track and Field Championships and the Texas State Tennis Championship. BASKETBALL: Eighty-eight of the 105 women sustained 184 injuries. Sprains, blisters, abrasions, contusions and shin splints comprised 81 per cent of the total number of injuries sustained. Foot blisters, ankle sprains, knee abrasions and shin splints were the most frequent combinations. TENNIS: Thirty-two players sustained sixty-six injuries. Blisters, abrasions and shin splints accounted for 82 per cent of the total number of injuries. Hand blisters, foot blisters and shin splints were the most frequent combination. TRACK AND FIELD: Fifty-eight participants reported seventy-seven injuries. Ninety per cent of the total number of injuries were classed as shin splints, blisters, abrasions and strains. Shin splints, foot blisters, knee abrasions, thigh strains were the most frequent combinations. Based upon the data collected the following conclusions were drawn: (1) the most vulnerable anatomical areas of the body in basketball were the feet, the ankles, the legs, the knee; (2) the most vulnerable anatomical areas of the body in tennis were the hands, the legs, the feet, the ankles; (3) the most vulnerable anatomical areas of the body in track and field were the feet, the lower leg, the knees, the thighs.

Miss Linda Jean Hammett
225 B North Main Street
Montevallo, Alabama 35115

April 4, 1971
5:15 p.m.

THE EFFECTS OF DELAY OF INFORMATION FEEDBACK ON LEARNING A MOTOR SKILL.* Frank L. Smoll, University of Washington.

The purpose of the study was to determine the effects of delay of information feedback (IF) upon the learning of a gross motor skill. Forty-five Ss were randomly assigned to three groups of 15 each. Following an initial warm-up and determination of the S's maximum duckpin bowling ball velocity, each S endeavored to learn to deliver a duckpin bowling ball at a specified velocity equal to 70% of his maximum velocity. Specially designed electronic equipment was utilized to obtain the velocity of a delivered ball (expressed as time for a distance of 60 feet); the velocity objective was given in seconds and hundredths-of-a-second. Each S performed 60 trials under conditions of repetitive trial presentation, and the E verbally presented IF in quantitative form (seconds and hundreths-of-a-second). For Ss in Group I, IF was presented immediately following each response. IF was presented 15-secs. after each response for Ss in Group II and 30-secs. after each response for Ss in Group III. An IF reminder technique was employed as a means of varying the delay of IF while maintaining constant post-IF and intertrial intervals for all groups. ANOVA tests were used to determine significance of between-group differences in the levels of performance achieved; also, trend analysis was employed as a means of testing for systematic variation in the performance of Ss who performed under the same experimental conditions as well as a means of examining and comparing performance curves of the groups exposed to different learning conditions. On the basis of the findings with regard to the learning of a gross motor skill, it was concluded that practice involving immediate IF or delay of IF that the human mechanism is capable of effectively bridging results in a significantly higher level of performance than practice involving delay of IF that exceeds the amount of time that the human mechanism can effectively bridge. A 15-sec. delay of IF does not result in a detrimental effect upon the level of performance achieved; whereas, a 30-sec. delay of IF is detrimental.

*This study was completed as part of a doctoral dissertation under the direction of Muriel R. Sloan, at the University of Wisconsin, 1970.

Frank L. Smoll
School of Physical & Health Education
University of Washington
Seattle, Washington

April 4, 1971
2:00 p.m.

TELEVISION AUGMENTED FEEDBACK IN LEARNING A BALANCE SKILL. John N. Drowatzky, The University of Toledo.

The purpose of this study was to investigate the effect of dynamic, concurrent television feedback on the acquisition of a stabliometer balance skill by 53 college male and female volunteers. All subjects were randomly placed into one of the three experimental groups and received ten 30 second practice trials on a stabilometer balance device followed in turn by a 30 second rest period. The amount of time each subject was off balance was recorded on an electric 100th second timer. The three conditions used in the experiment were a control balance situation in which the subjects received no television feedback, a balance situation in which the subjects observed their movements in a television moniter displaying their back, and a balance situation in which the subjects observed their movements in a television moniter displaying a frontal view. The data were analyzed with an analysis of variance design for repeated measures and the New Duncan's Multiple Range Test. Significance was reported at the .05 and .01 levels of probability. The use of artificial augmented feedback produced by television influenced the performance of female subjects on the stabilometer balancing task. If the image was presented in the same orientation as the subject was standing, performance was improved. A reversed image resulted in decreased performance. Identical feedback conditions had no effect upon the performance of men. This differing effect of feedback on men and women subjects was believed to result from differences in balancing ability and perceptual style.

John N. Drowatzky
Division of Physical Education
The University of Toledo
Toledo, Ohio 43606

April 4, 1971
2:15 p.m.

EFFECT OF SIZE OF STANDARD ON THE AMOUNT OF CONSTANT ERROR FOR KINESTHETICALLY MONITORED FORCE REPRODUCTION. Mary Lou Norrie, University of California, Berkeley.

The question as to whether for a kinesthetically monitored force reproduction task the amount of constant error changes according to Weber's Law as the size of the standard changes was investigated. The subjects were 22 male volunteers from college physical education classes. The apparatus consisted of a vertical steel bar with a handle at the top. The amount of bend induced in the bar was proportional to the force exerted at the handle. To avoid contaminating force judgments with extent of movement, movement of the bar was minimal (.13 inch for a 2 kg. force). For each trial the subject pushed the handle until the standard force was reached, held the standard for 3 seconds, released the handle, then regrasped the handle and attempted to reproduce the force. Each subject had four trials at each of 4 standards, 1 kg., 2 kg., 3 kg., and 4 kg. The constant error was recorded for each trial. Analysis of variance indicated no significant block, trial, or interaction effects. Consequently, it was concluded, that within the range of standards used, the size of the amount of constant error for the 2 kg. standard was similar to that found in previous experiments with women.

Mary Lou Norrie
200 Hearst Gymnasium
University of California
Berkeley, California 94720

April 4, 1971
2:30 p.m.

RETROACTIVE INTERFERENCE AND LEVEL OF ORIGINAL LEARNING IN VERBAL AND MOTOR TASKS. Richard A. Schmidt, The University of Michigan.

Earlier work has indicated that the relationship between amount of original learning (OL) and the subsequent retroactive inhibition (RI) was negative for verbal tasks and positive for motor tasks. The data from three earlier studies were reanalyzed and, when RI was measured as the mean decrement in performance in all studies, the relationship between OL and RI was positive for both motor and verbal tasks. However, relative RI score produced differences among the various findings, and an explanation was provided in terms of ceiling effects for the tasks. This reanalysis seems to indicate that a single theory of forgetting can be explanatory for both motor and verbal responding.

Richard A. Schmidt
Department of Physical Education
The University of Michigan

April 4, 1971
2:45 p.m.

ANALYSIS OF THE RELATIONSHIP OF SELECTED ABILITIES TO PERFORMANCE ON A GROSS MOTOR TASK AT VARIOUS STAGES OF TASK PRACTICE.

John P. Raducha, North Texas State University.

This study was concerned with determining the relationship of selected abilities to motor skill performance. Specifically this study analyzed the performance trend on a wall volley task to determine the degree of relationship between the abilities: agility, balance, depth perception, flexibility, reaction time and speed of arm movement, and strength and performance scores on a wall volley task at successive stages of task practice to find if there would be a systematic change in the combination of abilities contributing to task performance with extended task practice. 102 male freshman and sophomore students were given the following ability tests: The Side Step Test for agility, The Bass Stick Test for balance, The Howard-Dolman Depth Perception Apparatus for depth perception, Fleishman's Bend and Touch Test for flexibility, test for grip strength, and a reaction time and speed of arm movement test. Each subject performed 50 trials of a wall volley task that involved hitting for speed and accuracy with a wooden paddle and a tennis ball. The scores collected from the 50 trials were grouped into 10 stages of practice. The data were analyzed for the total sample population and for 4 skill level groups. The groups, quarters of the total sample population, were determined on the basis of the total score for the last 5 trials of the gross motor task. A linear stepwise multiple regression was used to determine the relationship between the abilities and performance on the wall volley task at the succeeding stages of practice to determine if there was a systematic change in the abilities that contributed to motor performance as task performance improved. The significance of a predictor as it was added to the regression equation was tested with an F ratio and was accepted at the .05 level. The following conclusions were drawn: (a) For college students the abilities that contribute to early stage performance are the same as those abilities that contribute to late stage performance on a wall volley task. (b) The abilities that are highly related to wall volley performance for a total sample population are not the same abilities that are primarily related to wall volley performance for specific skill level groups. (c) When individual skill level groups have been selected on the basis of their performance scores for the final stage of practice on a wall volley task, a convergence of the individual skill level performance curves does not take place. The curves will be similar in shape, however, differences will exist between the skill level groups at succeeding stages of task practice.

John P. Raducha
Physical Education Department
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April 4, 1971
3:00 p.m.

RETENTION OF VISUAL-MOTOR TRAINING EFFECTS. B. Robert Carlson, University of Kansas.

Purpose: The purpose of this study was to evaluate the retention of training effects following participation in a visual-motor training program.

Procedures: Thirty first-grade children who had been diagnosed as slow learners following performance on the Frostig Test of Developmental Vision and/or a teacher's recommendation were selected to participate in this study. Following a pre-testing on the Purdue Perceptual-Motor Survey and the Van Orden Stereoscope, the children were assigned to three groups so that equal groups were formed numerically and in average test performance. Group I received visual-motor training while wearing glasses reputed to enhance concentration. Group II received the same visual-motor training. Group III served as a control group that received normal daily activity undertaken by first-grade children enrolled in a public school.

The period of visual-motor training included 30 sessions of twenty minutes each in which a teacher worked with 2 children. The sessions were held once daily, Monday through Friday. In addition to the pre-testing (T_1) the tests were administered at the mid-point of training (T_2 after 15 sessions), at the end of training (T_3 after 30 sessions), and 8 weeks after the culmination of training (T_4). The measures analyzed by an analysis of variance treatment by groups design included the total score on the Purdue test, the 5 subtest areas of the Purdue test and a modified score on the Van Orden Stereoscope.

Conclusions: The following results were significant at the .01 level:

1. Significant improvement was noted between T_1, T_2 and T_3 for the experimental groups (G_1 and G_2) on the total score of the Purdue Test. No difference existed between T_3 and T_4.
2. Significant improvement was recorded between T_1 and T_2 for the experimental groups (G_1 and G_2) on balance and posture, body image and differentiation, and perceptual-motor match. No differences existed between T_3 and T_4.
3. Significant improvement for the total sample was recorded between T_1 and T_3 on ocular control.
4. Significant improvement for the total sample was noted between T_1 and T_3 on form perception.
5. Significant improvement for the total sample was recorded between T_1 and T_4 on the Van Orden.

B. Robert Carlson
Department of Physical Education
University of Kansas
Lawrence, Kansas 66044

April 4, 1971
3:15 p.m.

THE EFFECT OF INSTRUCTION AND PRACTICE ON THROWING ABILITY OF PRIMARY GRADE CHILDREN. Hubert A. Hoffman, University of South Florida.

The primary purpose of this study was to determine if instruction and practice improve the throwing ability of primary grade children above that which could be expected due to maturation and playing traditional throwing games. First-, second-, and third-grade boys and girls in two classes at each grade level were assigned randomly to grade level groups. The groups were assigned randomly to treatments (experimental and control). Preceding, and at the end of a six-week experimental period, criterion tests were administered to all subjects. A tennis ball throw for distance and a tennis ball accuracy throw were the criterion measures of throwing ability. All subjects had a daily 30-minute physical education class. Experimental groups received group and individual instruction on throwing and continuous practice in throwing. Control groups received no throwing instruction but played traditional throwing games. The primary statistical procedure was a Type I Analysis of Variance of the criterion measures to determine the significance of the treatment effects. Experimental group first-grade girls improved significantly over the control group on the accuracy and distance tests. Experimental group second-grade boys improved significantly over the control group on the distance test. There were no significant differences in favor of the control groups. In the remaining cases there were no differences in the effects of the two treatments. Practice and instruction on the one-hand overhand throw yielded greater gains in throwing for accuracy and distance than just playing throwing games. The girls in this study improved more than boys from participation in ball throwing experiences.

This study was completed as a doctoral dissertation at Indiana University, Bloomington, Indiana, with Dr. Evelyn A. Davies as the advisor.

Hubert A. Hoffman
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April 4, 1971
3:30 p.m.

AN INVESTIGATION OF SELECTED FACTORS RELATED TO CONSISTENTLY REPRODUCING A SPECIFIED VELOCITY OF A PROJECTILE IN THREE DIMENSIONAL SPACE. Trent E. Gabert, University of Oklahoma.

The purpose of the investigation was to determine the relationship of selected variables to the ability to repeat an overarm baseball throw at a specified velocity in three-dimensional space. The selected variables included: age, level of velocity, elements of velocity (time and angle of projection), and factors such as height, weight, and previous experience. Twenty male students of each age group -- 9, 10, 11, 12, and 13 years of age -- were randomly chosen as subjects for this study. The task for each subject was fifteen trials of attempting to reproduce his own perceived one-half maximum velocity of an overarm baseball throw. The throw was performed over a thirty-foot distance, but the velocity measurements were determined as the object moved over a one-meter distance of three-dimensional space. The time measurement was determined through use of a photomultiplier tube velocimeter. The results, obtained through regression analysis and analysis of variance techniques, suggested that maturity level with respect to the ability to consistently reproduce a specified velocity does not change during the age range of nine to thirteen year old subjects. The maximum velocity level and the perceived one-half velocity level at which a person was performing seemed related to the ability to consistently reproduce a specified velocity of an overarm throw. The lower the maximum and perceived one-half velocity levels, the greater was the ability to consistently reproduce a specified velocity. The ability to consistently reproduce a specified velocity was not influenced by height, weight, or previous experience of the individual.

Trent E. Gabert
University of Oklahoma
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April 4, 1971
3:45 p.m.

COINCIDENCE-ANTICIPATION BEHAVIOR IN CHILDREN.[1] Robert E. Stadulis, Mankato State College, Mankato, Minnesota.

In many physical activities and sports, accurate interception of a moving object (as a ball) is required for success or proficiency. The interception of the moving object has been termed "coincidence-anticipation." This study was designed to investigate the ability of children (7, 9 & 11 years old) to respond accurately in a laboratory coincidence-anticipation task. The four experimental variables examined were age, sex, practice, and rate of speed of the stimulus object. The coincidence-anticipation task employed consisted of releasing a response key at the same time that a ball propelled down a chute intersected a designated position on the chute. Accuracy was the difference between the ball travel time and the child's estimation of the travel time. Analysis of the data indicated that eleven year olds were more accurate than nine or seven year olds, but only at the two slow rates. However, seven year olds were most accurate at the fastest rate when compared to the other rates. It seemed plausible to suggest that younger children would learn certain ball skills more quickly if balls were propelled at relatively faster rates than at slower rates.

[1]This study was conducted in partial fulfillment of the requirements for the Ed.D. degree at Teachers College, Columbia University, under the direction of A. M. Gentile.

Robert E. Stadulis
Department of Physical Education
Mankato State College
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April 4, 1971
4:00 p.m.

A REGIONAL COMPARISON OF THE PHYSICAL GROWTH OF BOYS AND GIRLS DURING INFANCY AND CHILDHOOD. John L. Haubenstricker, Michigan State University; Vern Seefeldt, University of Wisconsin; Conrad D. Milne, University of Western Ontario.

The purpose of this investigation was to compare the growth of contemporary boys and girls from 2 through 12 years of age with that of children several decades ago. Children enrolled in the Motor Performance Study at Michigan State University (1968-1970) were compared with children in the Brush Foundation Study at Western Reserve University (1931-1941) and the Child Research Council (1929-1965) in measures of weight, standing height, sitting height, acromial breadth, cristal breadth, arm length, forearm length, and sitting height/stature ratio. The children represented similarly selected samples of the Lansing, Michigan; Cleveland, Ohio; and Denver, Colorado areas. The samples also reflected similar socio-economic levels. Means and standard deviations were calculated by sex and age on each of the seven variables for the Lansing children. Similar data for the Cleveland children were obtained from the Brush Foundation Study report by Simmons in the Monographs of the Society for Research in Child Development (Volume IX). Data from the Child Research Council, Denver were provided through the courtesy of Dr. Robert McCammon, Director. The mixed longitudinal data on 379 Lansing children and 999 Cleveland children were presented cross-sectionally. Data on the Denver Sample were presented longitudinally on 62 boys and 62 girls. In general, boys and girls in the Greater Cleveland area were found to be heavier, taller (standing and sitting) and had greater hip-widths at all age levels than boys and girls in the Lansing and Denver studies. However, Lansing children were found to have longer arms and forearms at all age levels studied and for both sexes. No notable differences for sex and age level were evident in the bi-acromial breadths of the three groups.

John L. Haubenstricker
Michigan State University
East Lansing, Mich. 48823

April 4, 1971
4:15 p.m.

LONGITUDINAL TRENDS IN MOTOR PERFORMANCE OF CHILDREN. Conrad Milne, University of Western Ontario; Vern Seefeldt, University of Wisconsin; John Haubenstricker, Michigan State University.

This study investigated longitudinal data expressed in cross-sectional form of performance changes of selected motor items of boys and girls from age 5 through 11 years. The original sample in January 1968 was comprised of 110 children (55 boys and 55 girls). Each subsequent summer approximately 35 kindergarten children were added bringing the present enrollment to 291 (160 boys and 131 girls). Semi-annual measurements were made on the following motor performance items: bent arm hang, thirty-yard dash, sit and reach, jump and reach, agility shuttle run, standing long jump and the 400 foot shuttle run. Longitudinal performance curves, based upon the mean score for each age group, were plotted for each motor performance item semi-annually from age 5 through 11 years. Separate curves for boys and girls were constructed. Motor performance scores generally indicated an improvement with successive years for both sexes in all items with the exception of sit and reach. This flexibility score for girls seemed to fluctuate about a mean level whereas the scores for boys tended to exhibit a negative effect after the age of 7½ years. Overall, the sexes were closely matched in performance at each age with several notable exceptions. In the thirty-yard dash boys were faster after the age of 9½ years. Boys out performed girls in the standing long jump as well as the jump and reach except at age 9½ years. In the 400 foot shuttle run girls had superior performances until the age 8½ years. Girls were markedly superior in the sit and reach except at ages 7 and 7½ when boys had higher score values. There was little difference in the agility run between the sexes although the boys had higher mean values. The flexed arm hang demonstrated the largest sex differences with the boys showing greater performance after 6½ years of age. These findings were compared to and were consistent with earlier reported studies by Keogh and Hanson where appropriate comparisons could be made.

Conrad Milne
University of Western Ontario
London 72, Ontario, Canada

April 4, 1971
4:30 p.m.

LONGITUDINAL ANALYSES OF SKINFOLD MEASURES AS RELATED TO SELECTED PHYSICAL TESTS FOR BOYS TWELVE THROUGH SEVENTEEN YEARS OF AGE. H. Harrison Clarke, University of Oregon; I. Barrymore Ward, Laurentian University.

The purposes of this study were to determine the inter-age consistency of skinfold measures for the same boys from twelve through seventeen years of age; and to show the relationship between the amounts of skinfold and tests of maturity, physique type, body size, gross and relative strengths, muscular endurance and motor ability of these ages. One hundred and thirteen boys, twelve years of age were the subjects utilized in this study. These boys were followed longitudinally to seventeen years of age. Skinfold measures were taken at three sites, triceps, sub-scapular and lateral abdomen. The sum of these measures represented the skinfold total and consisted the criterion measure for this study. Inter-age zero-order correlations for each of the skinfolds and for the total of these skinfolds were significant well beyond the .01 level. Almost without exception, the highest inter-age correlations occurred for adjacent ages, twelve to thirteen, thirteen to fourteen, to seventeen years. The highest zero-order correlations with skinfold total were found for endomorphy, ectomorphy, and weight. The correlations with Rogers' Arm Strength Score, Rogers' Physical Fitness Index and the standing broad jump were negative and significant at all ages. The zero-order correlations between skinfold total and endomorphy were higher than multiple correlations computed with other independent variables at all ages except seventeen years. With endomorphy excluded, the same independent variables of weight, height, and Rogers' Arm Strength Score produced high multiple correlations. The results indicated a significant relationship existed between the total amount of skinfold and performance in physical tests.

I. Barrymore Ward
Division of Physical Education
Laurentian University
Sudbury, Ontario.

April 4, 1971
4:45 p.m.

LONGITUDINAL ANALYSIS OF THE RELATIONSHIPS WITHIN MEASURES OF PERSONALITY AND BETWEEN THESE MEASURES AND PHYSICAL VARIABLES FOR BOYS AGES TWELVE TO SEVENTEEN YEARS. Bruce L. Howe, University of Victoria.

The study was conducted as part of the larger Medford Boys Growth Study directed by Dr H. Harrison Clarke. Five personality and twelve physical tests were administered to two independent groups of 71 and 64 boys. For all variables, except the Davidson Adjective Check List, product moment correlations were computed, and the .05 level accepted for significance. In addition, z-coefficient equivalents for correlations between the same variables were computed and the differences tested for significance. Percentage agreement tables were developed for selected adjectives from the Davidson Adjective Check List to examine consistency of responses between the same adjective at different ages and different adjectives at the same age.

All nine correlations obtained for the two indices of the Cowell Social Behaviour Trend Index at different ages were significant; these ranged between .295 and .710. For the scales of the C.P.I., 92 of 108 correlations, or 87 percent were significant. Similar consistency was found for responses to the selected adjectives; highest percentage agreement between ages ranged between 91.4 and 98.4 for the adjective, Stupid. Less consistency was found for the Cowell Personal Distance Ballot and the Sociometric Questionnaire; correlations ranged between -.076 and .749 for the Ballot and .264 and .437 for the Questionnaire.

Relationships between the various personality tests and their sub-scales varied considerably. Highest correlations were the inverse relationships between the positive and negative indices of the Cowell Social Behaviour Trend Index; these ranged between -.522 and -.805. Similarly, several high interrelationships were found between scales of the C.P.I., 528 of 918 correlations or 51 percent, were significant. Highest correlations were found at the oldest age of testing. When z-coefficient equivalents of correlations were tested, few differences were significant.

Few consistent relationships were found between the personality and physical tests. Highest correlations were obtained between the negative index of the Social Behaviour Trend and the P.F.I. and standing broad jump of -.536 and -.527 respectively. When z-coefficient equivalents of correlations were compared, almost none was significant.

Bruce L. Howe
Physical Education Section
University of Victoria

April 4, 1971
5:00 p.m.

MOTOR PERFORMANCE AND SCHOLASTIC TRENDS OF MEDFORD BOYS AS RELATED TO WETZEL-GRID FINDINGS. Robert W. Grueninger.

Purpose. H. Harrison Clarke's celebrated Medford data (1956-68) were retrospectively examined for possible relationships between power, strength, endurance, and academic achievement, on the one hand, and the quality of physical growth as determined from Wetzel Grid ratings on the other. Procedure. Although the 93 boys had been included in many previous reports, this was the first time that their annual growth data (ht.,wt.) were plotted on individual Wetzel Grids, which yielded point-estimates of size (level) and physique (channel) as well as interval estimates of direction (channel course) and speed (auxodromic progress) which were transformed into over-all quality ratings (satisfactory/unsatisfactory) depending on the degree of accordance with the grid rule: within channel progress at one level/month. Motor performance in tests of endurance, power, and strength was also evaluated at corresponding annual intervals. Eight to 11 year trends of growth and performance were compared graphically and by appropriate statistical analyses (regressions, anova, etc.) on an individual but also sub-group basis. Results. The Medford group as a whole was remarkably free from growth failure (less than 25% as compared with the commonly observed 33%); there was no boy with serious growth failure, so that the influence of unacceptable growth was not reflected in the averages as clearly as in individual cases. Systematic analysis of trends for left grip and cable-tension strength, Rogers' PFI, bar dips, and standing broad jump indicated an association between satisfactory growth on the one hand and good or superior motor performance on the other. Unsatisfactory growth was regularly accompanied by inferior test scores even though differences did not always reach the usual significance levels. In boys matched for size, grip and cable-tension strength were greater among the medium and slender than among the stocky and obese types. Body size (level) was more closely related to performance than was age. Small sample variability obscured the Van Iden-Hopwood effects of poor growth on academic achievement. A priori in the absence of G.F. no effect on performance could be expected, and little was found. Put otherwise, when growth is up-to-par in direction and speed, as in the Medford boys, so, too, is motor performance as judged by contemporary trends. Small sub-sample numbers were also a limiting factor in final results. A major conclusion: to overlook a boy's growth, physique, body size, and speed of development is to ignore the foundation of his physical as well as of his academic performance.

Robert W. Grueninger
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April 4, 1971
5:15 p.m.

AN ELECTROMYOGRAPHIC STUDY OF THE EFFECT OF PARTICIPATION IN THREE SELECTED GROSS MOTOR ACTIVITIES ON RESIDUAL NEUROMUSCULAR TENSION.

Loretta T. LeBato, The Texas Woman's University.

The present investigation entailed a study of sixty women enrolled at the Texas Woman's University during the spring semester, 1969-1970, to determine the effect of participation in light, moderate, and heavy levels of gross motor activity upon residual neuromuscular tension as measured by quantitative electromyography. The recreational activities selected for the purpose of the study were bowling, swimming, and modern dance. Electromyographic techniques were used to measure the amount of residual tension in the biceps brachii and rectus femoris muscles before, during, and after an experimental period of nine weeks participation in the selected activities of a required physical education program.

A research design of four groups was employed. Each group was comprised of fifteen college women, designated as a light level exercise group, which was a bowling class, a moderate level exercise group, which was a swimming class, a heavy level exercise group, which was a modern dance class, and a control group, subjects participating in no organized program of physical activity. Lottery methods were used to select the specific class of bowling, swimming, and modern dance, and the subjects to participate in each of the groups.

Data were collected through the administration of a pre-test, mid-point test, and post-test. A Newport Laboratories Integrating Bioelectric Monitor coupled with an electronic counter was used for EMG observations taken approximately one hour after participation, repeated six hours later, and after twenty-four hours during the initial and final testing periods, and approximately one hour after participation during the mid-point testing period. Analysis of variance, a two factor mixed design of repeated measures for one factor, and Duncan's Multiple Range Test comprised the basic analytical procedures.

The findings revealed that there was no significant difference between the groups on all measurements taken. Only on the measurements of the biceps brachii taken approximately one hour after participation in the activity did the activity groups change significantly in tension levels from the initial to final test. A Runs Test indicates that the consistent trend of the activity groups to lower the residual tension after participation is significant (.05). Based upon the results of the study, it was concluded that the participation in recreational activities of bowling, swimming, and modern dance of a required physical education program for nine weeks does not significantly lower residual tension beyond a short transitory period.

Loretta T. LeBato
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April 5, 1971
1:45 p.m.

AN ELECTROMYOGRAPHIC STUDY OF BALLISTIC MOVEMENT IN THE TENNIS FOREHAND DRIVE. Jean P. Anderson, Michigan State University.

The purpose of this study was to investigate the muscular activity in the tennis forehand drive to determine if the muscle action potential of selected muscles gives an indication of either ballistic movement or varying degrees of ballistic movement in highly skilled and in lesser skilled individuals. The data for this study was obtained from nine women subjects three of whom were assigned to each of three skill levels, beginner, average, and highly skilled. Two methods of data collection, electromyography and cinematography, were used to determine muscle action potentials of eight muscles or muscle parts in addition to the velocity of the tennis forehand drive from beginning of forward arm swing to point of ball contact. The muscles investigated were: anterior deltoid, biceps brachii long and short heads, brachialis, coracobrachialis, pectoralis major, and triceps brachii lateral and long heads. Each subject executed five trials for each muscle tested giving a total of 40 trials per subject. All trials were performed with the use of a stroke developer to insure consistency and standardization of each stroke. Simultaneous electromyographic and cinematographic records of each trial were analyzed for evidence of decreased muscular activity prior to ball contact and determination of velocity for forward arm swing. Decrease in muscular activity was determined by calculating the slope of the line of decrease in activity. There is consistency of muscle activity in average and highly skilled subjects indicating a well developed stroke pattern. Between subjects and skill levels there is a great variation in muscle activity precluding any overall analysis of muscle involvement. Ballistic movement as defined does not appear in the tennis forehand drive. Efficiency of the more skilled players results from a decrease in muscular activity rather than a complete absence of muscular tension. There does not appear to be a direct relationship between increased velocity and greater decrease in muscular activity. Slope of the line of decrease in muscle action potential provides a quantitative measure for the evaluation of the electromyogram.

Jean P. Anderson
Physical Education Department
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East Lansing, Michigan 48823

April 5, 1971
2:00 p.m.

ELECTROMYOGRAPHIC ANALYSIS OF A MOTOR-LEARNING TASK. Garland O'Quinn, Pennsylvania State University.

Although the electromyographic record has been shown to be linearly related to isometric tension there is reason to believe that skill level, anxiety due to competition, and extent of progress through the learning process can also affect the amount of muscle activity used in a given isometric tension requirement.

In order to examine the relationship between skill in maintaining an isometric tension level and the associated muscle activity, a tension-tracking task was devised. The task was constructed so as to require subjects to accurately match a given isometric tension. If subjects matched the force which a mechanical arm placed upon their forearm with an exactly equal force in the opposite direction then no movement would occur. At one second intervals the direction of the force exerted upon the subject by the mechanical arm alternated from extension to flexion. Any difference between the force exerted by the subject and the force exerted by the mechanical arm resulted in movement which was measured for an error score. The levels of force exerted upon a subject remained constant throughout the experiment and were set at 10% of the maximum capacity of the muscle group which was to oppose them.

An electromyographic record was taken from surface electrodes on both the forearm flexor and extensor groups. By integration techniques a value for the level of activity in each muscle group was obtained.

Skill level was found to be significantly correlated with EMG activity in 13 of the 17 subjects tested. In 11 of these 13 subjects activity in the prime mover correlated with skill and in 10 of the 13 subjects activity in the antagonist correlated with skill.

These findings suggest that skill level (or amount of experience, which closely parallels skill level) may be an important factor in determining the total amount of muscle activity which the subject will use to accomplish a given task. Further research may serve to differentiate that muscle activity which is due to anxiety and psychological factors from that muscle activity which is due to the biomechanical requirements of the task.

Garland O'Quinn
Biomechanics Laboratory
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April 5, 1971
2:15 p.m.

ELECTROMYOGRAPHIC STUDY OF FATIGUE OF THE BICEPS BRACHII AND BRACHIORADIALIS DURING SUSTAINED MAXIMAL VOLUNTARY CONTRACTION.

Robert N. Aebersold, Slippery Rock State College.

It was the purpose of this study to investigate the effects of local muscular fatigue upon the action potentials recorded from the biceps brachii and brachioradialis during a maximal isometric elbow flexion task when the elbow was positioned at the angles of 45, 115, and 170 degrees. The changes which occurred in the electromyograms during development of fatigue and the influence of muscle length upon these changes were studied. A two-minute maximal isometric contraction was performed at each of the elbow angles by each of the 31 subjects. The force, measured by a load cell, and the action potentials, monitored by surface electrodes, were simultaneously recorded. The records were scored at equally spaced intervals, utilizing the planimetry technique for the electrical activity. The effect of induced muscular fatigue upon the force exerted by the muscles and the EMG recorded from the muscles during the maintenance of a maximal voluntary contraction was one of decrease, regardless of the muscle length. While the tendency to decrease was not affected by the muscle length, the shapes of the extinction curves appeared to vary with the length of the contracting muscle. Muscle length, in turn, appeared to influence the magnitudes of the force and EMG measures. The greater the magnitude of a variable at the beginning of the sustained contraction, the steeper the slope of the extinction curve. Furthermore, a more complex curve was required to describe the change of electrical activity when the initial measure was greater.

*The computer time for this project was made available through the facilities of the Computer Science Center of the University of Maryland.

Robert N. Aebersold
Slippery Rock State College
Slippery Rock, Pa. 16057

April 5, 1971
2:30 p.m.

KINEMATIC ASPECTS OF OVERARM THROWING SKILL IN ADULT MEN. Anne E. Atwater, University of Arizona.

The purpose of this study was to investigate kinematic aspects (displacement, velocity, and acceleration) of the overarm throw performed by skilled men.

Procedure. The five fastest right-handed throwers (excluding pitchers) were selected from a university varsity baseball team and were photographed performing three trials of a maximum velocity overarm throw. Initial ball velocities ranged from 110 to 125 ft/sec. Three 16 mm. Kodak Ciné-Special cameras, operating at 64 frames/sec, were used to record simultaneously the side, rear, and overhead views of each throw. One trial of each subject was selected for analysis. The basic measures consisted of x, y, and z coordinates of the ball's position in each film frame during the .40 sec preceding release and immediately following release. From these measures, the three-dimensional displacement, velocity, and acceleration of the ball in space were determined. A descriptive analysis was then undertaken of the joint actions which occurred and were associated with the displacement and resultant velocity of the ball prior to and at release.

Conclusions.

(1) Distinct phases of rapid acceleration and deceleration of the ball preceded final acceleration of the ball toward release in all five subjects. In the brief time interval of .07 to .12 seconds before release, all subjects accelerated the ball from a velocity of less than 20 ft/sec to the velocity measured at release.

(2) The early increase in resultant ball velocity occurred as the right shoulder abducted and laterally rotated to move the ball upward in its backswing. The subsequent decrease in ball velocity, during which time the ball lagged briefly behind the head and shoulders, was associated with the increased speed of forward trunk rotation and shoulder lateral rotation with the elbow flexed 90 degrees. The on-going but decelerating forward trunk rotation, and the joint actions of right elbow extension, shoulder medial rotation, and forearm pronation contributed to the final acceleration of the ball during the .07 to .12 seconds before release.

Anne E. Atwater
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Tucson, Arizona 85721

April 5, 1971
2:45 p.m.

MULTIPLE CHOICE REACTION TIME AND MOVEMENT TIME DURING PHYSICAL EXERTION. Stuart Levitt, Brooklyn College; Bernard Gutin, Teachers College, Columbia University.

Purpose. This study examined the effect of treadmill walking at various heart rates (HRs) on multiple choice reaction time (RT) and movement time (MT).
Procedure. Twenty male college students received 25 RT practice trials and then walked on a treadmill at speeds and grades which were adjusted to keep their HRs at the predetermined levels of 80-90 (standing still), 115, 145 or 175 beats per minute (bpm). It took no longer than 2.5 minutes for the Ss to reach the specified levels and the RT trials began after a total of 6 minutes of walking. The order of treatments was randomized for each S. While walking, the S reacted to one of 5 lights by raising his finger from one button and pressing down the button corresponding to the light stimulus. The time between the stimulus and the release of the first button was RT. For 10 of the Ss the time from the release of the first button to the depression of the next button (MT) was recorded.
Results. Treatments x subjects analyses of variance for both RT and MT revealed significant F ratios. Trend analysis indicated a significant curvilinear relationship between HR and 5-choice RT, with optimal performance at a HR of 115 bpm and worst performance at 175 bpm. This supported the hypothesis of an inverted U-shaped relationship between exercise-induced activation and choice RT. On the other hand, MT improved linearly with increases in HR, with optimal performance demonstrated at a HR of 175 bpm.

Bernard Gutin
Teachers College, Columbia Univ.
New York, New York 10027

April 5, 1971
3:00 p.m.

THE OLYMPIC GAMES AFTER VARAZTAD AND BEFORE COUBERTIN.

Richard D. Mandell, University of South Carolina

The sentimental regard for the ancient Olympic Games did not spring suddenly to life in the 1890's. From the Latin Olympias various words derived from the site, the four-year period and the Games passed into all the European languages. Shakespeare mentioned the Olympic Games in two of his plays; Milton referred to "The Olympian Games" in Paradise Lost. In the early seventeenth century Robert Dover established a long series of "Olympick Games" at his estate in the Cotswolds. For 40 years Dr. W. P. Brookes in the later nineteenth century staged athletic festivals on some "Olympian Fields" in Shropshire. The great German archaeologist, Ernst Curtius (1814-1896), proposed a revival of the ancient Greek athletic festival. The modern Greeks themselves had ambitious athletic meets in Athens first in 1859 and several times afterwards that they called Olympic Games. Classical sentimentality was a leitmotif of cultural life in the nineteenth century. This, plus strong trends favoring sport and internationalism, suggest that polyglot sporting festivals would have come about somehow and that they very likely would have been called Olympic Games. Still, the modern Olympiads took and held certain forms due to Baron Pierre de Coubertin's domination of the International Olympic Committee.

Richard D. Mandell
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April 5, 1971
3:15 p.m.

A STUDY OF AMATEURISM IN SPORTS. Eugene A. Glader, Bethel College.

The purposes of this study were to (1) identify the basic purposes and distinctions of amateurism in sports during its development and currently, (2) identify some problems in applying the current definitions of amateurism to contemporary societies, and (3) suggest some solutions to the problems of amateurism thus identified. The problem was approached from an historical and philosophical perspective. The procedure used to collect the data and to fulfill the purposes of the study involved an extensive use of libraries, correspondence with numerous international and national amateur sports organizations, and consultation with certain select individuals. The historical approach to the problem included a review of the history of athletics in ancient Greece and of the development of sports and amateurism during the nineteenth and twentieth centuries. The development of contemporary amateurism in sports began slowly during the early part of the nineteenth century. With the growth of athletic interest during the second half of the nineteenth century amateur sports became a major category in athletic competition. The major purposes of amateurism as a category of sports have been to separate athletes on the basis of class or social position, athletes with various special advantages, and athletes with diverse motives. Four of the major problems involving amateurism in sports relate to (1) restrictions on the amount of time which an athlete can spend in practice and competition, (2) restrictions on the opportunity to capitalize on one's athletic ability, (3) attempts to determine the motives of people who participate in athletics, and (4) the inequality of opportunity within contemporary amateur sports. Underlying these problems is the major problem--the prevalence of hypocrisy and deceit. These problems arise partially from the fact that amateur sports organizations have defined amateurism with a "sport" emphasis, but are conducting and promoting competition with an "athletic" emphasis. The major proposal made in this study as a solution to the amount of problems of amateurism was that restrictions on the amount of time spent in practice and competition should be eliminated and categories of competition should be established on the basis of skill.

Eugene A. Glader
Bethel College
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April 5, 1971
3:30 p.m.

AN EXPLICATION OF THE ROLE OF AESTHETIC VALUE IN AMERICAN PHYSICAL EDUCATION: A CONCEPTUAL ANALYSIS OF PHYSICAL EDUCATION LITERATURE. Rodger S. Rickard, Stanford University.

The focus of this dissertation is upon the role which aesthetic value has played in American physical education from 1885 to 1970. The investigation seeks to determine the ebb and flow of aesthetic value through the years of professional development; and to identify and describe the changes in the thinking of American physical educators, as expressed in their writings, regarding the role of aesthetic value in physical education. In order to identify the assertions, propositions, and observations physical educators have had about the aesthetic functions in physical education, statements have been selected from the literature if they referred directly to the aesthetic and/or artistic nature of physical education or if they referred to the formal, expressive, or sense qualities of human movement as reflected in the major views of the following aestheticians: Clive Bell and Roger Fry, Susanne Langer, Rudolph Arnheim and John Dewey. Source materials found in American physical education journals, professional yearbooks, reports of conferences, convention proceedings and doctoral dissertations were used in this investigation to relate the changes in aesthetic thought to the trends affecting the development of American physical education as a profession. For the sake of clarity and continuity, the data collected from the source material has been presented chronologically with emphasis given to the topics of curriculum, teacher education and implementation of theory into practice. Interest in the aesthetic qualities of human movement has never been of primary concern to the American physical education profession. The primary objectives of physical education through the years of professional development have been health and physical fitness and the social and educational values derived from the physical education experiences. Aesthetic value has had an ebb and flow in the development of the profession that is directly related to the primary objectives of health and physical fitness and the social and educational values.

Rodger S. Rickard
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April 5, 1971
3:45 p.m.

ATTITUDES OF ONE ORDER OF CATHOLIC SISTERS TOWARD PHYSICAL EDUCATION AND THEIR RELATIONSHIP TOWARD LEISURE-TIME ACTIVITIES.

Phyllis A. Heavern, Spalding College.

Since physical education programs in parochial schools are often sub-standard, the writer decided to see if this was the result of a negative attitude toward physical education on the part of the Sisters who operated the school. One order of Sisters was selected and all of the Sisters who were involved in education were sent an attitude questionnaire. The questionnaire booklet was composed of three parts: Part I was devoted to background information about the Sister; Part II was a chart to determine leisure-time activities of the Sisters; Part III was the attitude questionnaire. The attitude statements were statistically analyzed by percents of responses, as well as the Chi-Square Test of Independence. When the latter test was applied, the total group was evaluated by the geographical province which the Sister was in and the background variables from Part I. The evaluation of a Sister's former physical education class was the background variable which was most often significantly related to the attitude responses. The chart of leisure-time activities was analyzed using percents. The data revealed that the activities most frequently participated in were generally those of a sedentary nature. The activities which the fewest number of Sisters indicated were sports activities. The attitude scale was then scored using the Likert technique. These scores indicated that the Sisters' attitudes were mostly highly positive or positive, with a few indicating that they were undecided. No Sisters had negative or strongly negative scores. The Pearson Product-Moment method of correlation was used to correlate the scores for the attitude scale with the number of sports activities which the Sisters indicated that they took part in. Significant relationships were obtained for four of the six provinces and the total group. This same method of correlation was also used to see if there was a relationship between the attitude scale scores and the various background variables. This analysis was also evaluated by provinces and significant relationships were found for four of the groups when their evaluation of physical education was correlated against the score. Inverse significant relationships were observed for some of the groups when the scores were correlated against length of time in the order, educational background, and age.

Phyllis A. Heavern
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April 5, 1971
4:00 p.m.

COMPARATIVE PERCEPTIONS OF TEACHER COMPETENCE BY THREE GROUPS OF EDUCATORS. Mary Seymour Owens, Texas Tech University.

It was the purpose of this study to compare the perceptions of teacher competence within and among three groups of educators (classroom teachers, college supervisors and public school administrators) as measured by the interview scales of the Instrument for the Observation of Teaching Activities, known as IOTA. The total instrument attempts to measure teacher competence as defined by the California definition described in Six Roles of Teacher Competence. Six respondents, two interviewers, and thirty recorders were randomly selected from all personnel who had completed at least one IOTA Workshop. Each respondent was interviewed for 30 minutes using a structured type interview in which questions had been prepared previous to the interview. These interviews were video taped and scored by 30 recorders trained in a common philosophy and in the use of the Instrument. The recorders made factual notes from the video tapes from which they later identified the item on the instrument most nearly descriptive of what they saw and heard. These items were scrambled in order to avoid halo effect. A reliability coefficient for each group of recorders and for the total of the three groups of recorders was calculated from the statistics generated by a three-way analysis of variance. Subsequently, main effects and interaction effects were tested for significance where appropriate. A two-way analysis of variance was then utilized to test for the significance of differences among the three groups of recorders and within each group of recorders and within all recorders on each individual scale. Finally, a one-way analysis of variance was utilized to evaluate differences among the mean scores recorded by the three groups of recorders on individual scales for each respondent. The major findings and conclusions of this study were as follows: (1) The reliability coefficients as determined by the three-way analysis of variance for each of the three groups and for the total [30] recorders indicated a difference in perception as follows: Administrators .773, Classroom Teachers .618, College Supervisors .952, Total [30] Recorders .961, (2) the interview, normally considered a qualitative tool, can be evaluated with quantitative techniques, (3) administrators, classroom teachers, and college supervisors perceive many areas of teacher competence similarly, and (4) the IOTA Interview Scales differentiate among respondents in varying levels of teacher competence.

Mary Seymour Owens
Women's Physical Education Dept.
Texas Tech University
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April 5, 1971
4:15 p.m.

SOCIAL NORMS AND LEVEL OF ASPIRATION IN ELEMENTARY SCHOOL CHILDREN. David A. Sleet, John N. Drowatzky, The University of Toledo.

This investigation is a part of the "Toledo Growth Study," a longitudinal research project of the growth characteristics of elementary school children. One hundred and seventy 4th grade boys and girls from schools in 3 different socioeconomic areas were tested on a hand dynamometer task to determine the effects of social norms on level of aspiration. Four discrepancy scores were obtained on each subject, the last of which reflected the influence of an interpolated social norm. Onehalf of the subjects received a high norm (failure) while the other half received a low norm (success). Analysis of variance of discrepancy scores revealed significant differences between groups following exposure to the social norm. Duncan's New Multiple Range Test and paired t comparisons were used to further test the effects of social norms on aspiration discrepancy scores. The results revealed that rural girls differed from all other groups in their response to a low norm situation. Their aspirations were lowered in the success situation. Inner city girls, in contrast to all other groups, significantly raised their aspirations when their performances failed to meet the social norm. It appeared that in regard to physical strength performance, social norms had more influence on girls than boys. These results suggested that elementary school children's level of aspiration can be altered through social norm anchoring and that the nature of these changes varies according to the sex and socioeconomic status of the child.

David A. Sleet
Division of Physical Education
The University of Toledo
Toledo, Ohio 43606

April 5, 1971
1:45 p.m.

SOCIOMETRIC ACCEPTANCE AND REJECTION OF FOURTH GRADE BOYS AND GIRLS AS RELATED TO STRUCTURAL AND FUNCTIONAL PHYSICAL VARIABLES.

Jan Broekhoff and Robbert Verschuur, The University of Toledo.

The purpose of this study was to investigate the relationships between social acceptance-rejection and selected structural and functional physical variables in fourth grade boys and girls. The subjects were 88 boys and 88 girls from six self-contained fourth grades of Toledo area elementary schools who participated in the "Toledo Growth Study," a longitudinal investigation of the growth characteristics of elementary school children. Social status scores were determined for each subject on the basis of acceptance-rejection choices by classroom peers. The subjects were also tested for the following structural and functional physical variables: standing height, body weight, triceps fat fold, biceps and calf girth, bi-acromial and bi-cristal width, Rogers' Physical Fitness Index, pull-ups, standing broad jump, and a dodge run. The relationships between the measures of social status and the physical measures were determined by product-moment correlation. Coefficients were tested for significance at the .05 level. The results and conclusions can be summarized as follows: (1) Intercorrelations among structural and functional physical variables indicated that body size and body bulk tended to have a negative influence upon the performance measures in this study, especially for girls. (2) In the evaluation of their peers, boys and girls showed a moderate degree of agreement in their ratings. (3) With the exception of bi-acromial width, all of the structural variables showed low, significant negative correlations with the acceptance-rejection scores for girls, indicating a slight tendency for heavier and bulkier girls to have a lower social status rating. As a pattern, this tendency was not observed for boys. (4) With few exceptions, the performance measures had low, significant positive correlations with the acceptance-rejection scores for boys as well as for girls, lending some support to the contention that physical fitness, power, and agility are positive factors in acquiring social status among fourth grade children.

Jan Broekhoff
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April 5, 1971
2:00 p.m.

THE RELATIONSHIP BETWEEN PHYSIQUE AND THE TYPE AND NUMBER OF PROBLEMS CONFRONTING NINTH GRADE BOYS. Stuart E. Storey, Holbeach, England; William H. Solley, deceased; William B. Koch, Western Kentucky University.

The purpose of this study was to determine the relation between physique and problems and worry topics of ninth grade boys. The Mooney Problem Check List for Problem and Worry Items was administered to 245 boys in area schools in Warren and Simpson Counties. Subjects were grouped into three physique groups through use of the Wetzel Grid. Problem and worry topics were grouped into eleven areas. The Chi Square technique was used to test the statistical significance of differences in the number of students in physique groups that selected various problem and worry areas. The following conclusions were drawn from the analysis: (1) The three physique groups did not differ in the proportion of students selecting most problem or worry areas; (2) The thin group was statistically less adjusted in the "home and family" problem area; (3) Fat boys showed statistically more worry items; (4) When students "perceived" their physique, six problems areas were isolated statistically, with fat boys showing more problems than others; (5) There were far more differences in problem and worry indications in terms of "perceived" physique than there were in actual physique as determined by the Wetzel Grid.

William B. Koch
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April 5, 1971
2:15 p.m.

THE RELATIONSHIP OF ORDINAL STATUS TO SEX-ROLE IDENTITY, FATHER-IDENTIFICATION, AND SELF-ESTEEM AMONG UNIVERSITY MALES.
JOHN C. NASH, UNIVERSITY OF WATERLOO.

Designed to determine the relative effects of ordinal status on the self-esteem, sex-role identity, and father-identification of university males, the study employed a judiciously selected sample. Sons under 21 years of age, enrolled as full-time students during the quarter in question, single and products of families having at least three male siblings were tested. The 210 all-male sample was found to closely proximate the 'normal' university population over the variables of age, religion, residences, and social class. Osgood's semantic differential technique was the principal research instrument. A set of 12 bipolar personality scales was administered anonymously to all subjects with instructions to rate on each scale their concepts of MAN, SELF, WOMAN, FATHER and IDEAL MAN. Multivariate analysis of the data revealed relatively few significant differences over each of the following breakdowns: ordinal status, religion and family density. Grouped by ordinal status, there were no significant differences either in the sex-role identities or in the self-esteem of the subjects. Occupational prestige of father bore no significant weight upon the self-esteem of the sons; nor did the expressed career choices of the sons themselves. Sons sharing equally the costs of their education with their fathers were found to have higher levels of self-esteem than both those who accounted for more than 75 per cent of their university expenses, and those who paid less than 25 per cent of their own way. In deference to the findings and in accord with the data analyses reported, it was deemed prudent to conclude that within the limitations of the study, ordinal status was not a significant factor in the sex-role identity, father-identification, or self-esteem of the male university student.

John Colin Nash
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University of Waterloo
Waterloo, Ontario

April 5, 1971
2:30 p.m.

BIRTH ORDER, FAMILY SIZE, MALE SIBLINGS, AND ATHLETIC PARTICIPATION. Lee Vander Velden, University of Maryland.

Studies have related birth order to (1) attendance in college, i.e., first borns are overrepresented in college; (2) personality characteristics, i.e., first borns are more fearful and have a greater desire to affiliate; and (3) differences in sport participation. Based on findings in these three areas it was hypothesized that (1) first borns are underrepresented in sports with a high risk of personal injury; and (2) athletes participating in dangerous sports come from larger families than those who participate in sports with a lower risk of personal injury. Dangerous or fear provoking sports are those with a high risk of personal injury. Birth order, family size, and sports participation information was acquired from two hundred varsity athletes from a large midwestern university. The sample consisted of athletes participating in basketball, baseball, crew, fencing, football, hockey, swimming, tennis, track, and wrestling. The Greenwood-Yule method of determining family size and expected frequencies of birth orders was used to compare athletes from fear provoking sports (baseball, football, hockey, and wrestling) with those from non-fear provoking sports. The consistent finding that first borns are overrepresented in college was supported. There was a birth order effect within the total sample ($P < .05$); eighty-nine of two hundred athletes were first borns. There were no birth order differences to distinguish athletes in fear sports from those in non-fear sports. Family size differences were evident with competitors in the more dangerous sports coming from larger families. Fifty-two percent of the fear sport athletes came from families larger than size three as opposed to only twenty-nine percent of the non-fear sport athletes. For each high risk sport the mean family size was greater than the largest mean family size for any low risk sport group. Furthermore, the differences in the family size can be explained by the presence of male siblings in the families of fear provoking sport athletes. Thus, although first borns participate in dangerous sports, athletes competing in fear sports have experienced the effects of large families, i.e., families in which the athletes had at least one male sibling.

Lee Vander Velden
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April 5, 1971
2:45 p.m.

THE EFFECT OF TEAM SUCCESS AND FORMAL STRUCTURE ON INTRA-TEAM RELATIONS AND COHESIVENESS OF BASEBALL TEAMS. Daniel M. Landers, State University of New York, Brockport; Thomas F. Crum, Triton College.

The primary purpose of this investigation was to test the general proposition that successful as opposed to unsuccessful teams have greater group cohesiveness. To test this proposition, 302 high school baseball players, members of 26 teams, responded to a cohesiveness questionnaire before and again at the end of the league season. A second within-team comparison of the ratings received by infielders (high interactors) and outfielders (low interactors) was also examined since previous research on the formal organizational structure of baseball teams has shown high interactors are perceived and evaluated more positively than low interactors. The questionnaire, which was designed by Martens and Peterson, assessed various components of cohesiveness such as interpersonal ratings of friendship, power, and ability, and also asked for team members' relationship to his group (sense of belonging and value of membership) and evaluation of the group's teamwork and closeness. On the basis of percentage of games won by each team, 11 teams were classified as successful and another 11 teams were classified as unsuccessful. A one-way multivariate analysis of variance (infielders' vs. outfielders' ratings) was used to determine pre-season differences on intra-team relations, while a 2 X 2 multivariate analysis of covariance (two levels of formal group structure and two levels of team success) was used for post-season ratings with the pre-season ratings covaried out. Results showed that team member ratings of infielders and outfielders did not differ significantly in the pre-season and post-season, and did not interact significantly with the team success factor. The team success factor did not differentiate between successful and unsuccessful teams on components of cohesiveness and questions assessing team members' relationship to their group. However, when directly asked about the cohesiveness of the team, successful teams were significantly more cohesive than unsuccessful teams. The discriminant function analysis for the team success effect showed that the team members' direct evaluation of closeness, rather than teamwork, differentiated the most between successful and unsuccessful teams.

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April 5, 1971
3:00 p.m.

SUCCESS AND RESIDENTIAL AFFILIATION AS DETERMINANTS OF TEAM COHESIVENESS. James A. Peterson and Rainer Martens, University of Illinois at Champaign-Urbana.

The present study determined the influence of success and residential affiliation on the post-season cohesiveness of college intramural basketball teams. In addition, it was determined whether or not an initial difference existed in the cohesiveness between basketball teams organized from three different residential organizations.

Over 1200 male college students, members of 144 basketball teams, completed a pre- and post-season questionnaire which assessed nine different aspects of cohesiveness. The nine measures were assessed by three types of questions: direct individual assessment of a component of cohesiveness, sociometric evaluation, and direct individual assessment of the team as a whole. Three residential organizations and three levels of success were the independent variables. The pre-season cohesiveness levels were analyzed by a univariate and a multivariate one-way analysis of variance. Covarying out the pre-season differences between the teams, the post-season data were analyzed by both a univariate and a multivariate two factor (3 X 3) analysis of covariance.

Results indicated that the pre-season level of cohesiveness significantly differed among the three residential organizations. Both the univariate and the multivariate analyses of variance supported the hypothesis that fraternity (FRAT) teams are initially more cohesive than teams from either men's residence halls (MRH) or men's independent associations (MIA). In contrast to the influence of residential affiliation on pre-season cohesiveness, post-season cohesiveness did not significantly differ among the FRAT's, MRH's and MIA's when initial cohesiveness was covaried out. The results of the univariate and multivariate analyses of covariance revealed that success increased post-season cohesiveness as compared with moderately successful or unsuccessful teams. No significant interaction between residential affiliation and success was found. The findings were discussed in relation to the extant group cohesion and interpersonal attraction literature. Methodological problems in assessing group cohesiveness were also considered.

James A. Peterson
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April 5, 1971
3:15 p.m.

A Field Experimental Study of Cohesiveness Status and Attitude Change in Four Biracial Small Sport Groups. Thomas D. McIntyre, Penn State University.

This field experiment investigated social status, cohesiveness, and racial attitudes during the formation of four biracial sport groups. Flag football was the activity for the interaction of 23 black boys from an urban junior high school with 22 white boys and 1 black boy from a suburban school. Seven observers recorded significant interactions between and within the four biracial sport groups over a five week period involving 20 contact sessions. Quantitative measures of sociometric choices and cohesiveness were used to validate observational measures. Upon completion of the experimental treatment, attitudes on ethnicity were assessed by means of the Own Categories procedures. The attitudes of 46 experimental subjects were compared to an equal number of control subjects. Definite group structures with differentiated statuses emerged as the biracial sport groups interacted repeatedly. The black boys were highest in the hierarchial structures on the variables of leadership and athletic prowess. Color was not as salient when choosing friends, i.e., the contact served to weaken the color norm as a classification for selecting friends. Racial attitudes were not changed significantly by the experimental treatment although there were indications of a more positive effect upon white subjects than upon their black counterparts. Winning and team cohesiveness were strongly related; however, there was no evidence that highly cohesive teams produced more favorable attitude change than less cohesive teams.

Thomas D. McIntyre, Ph.D.
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April 5, 1971
3:30 p.m.

PERSONALITY TRAITS OF UNITED STATES ALPINE SKI TEAM MEMBERS AND THEIR INTERRELATIONSHIP WITH SELECTED PHYSIOLOGICAL FACTORS

Purpose. The purpose in this study was to investigate the personality make-up of the U.S. Ski Team members to: (1) identify the motivational forces which were behind each individual's need to compete at this level, (2) determine relationships, if any, between personality source traits and measures of decision-making time in a motor task, and (3) compare the psychological characteristics of national skiers with other sport participants. Procedure. The members of both the Men's and Women's United States National Alpine Ski Teams comprised the population used in this study. There were fifteen men and sixteen women skiers who participated in our study. Measures of the athlete's primary and secondary personality factors along with other selected measures of motor ability and organic fitness were secured at the National Team's, Bend, Oregon, Training site in September, 1970. The psychometric measure which was used was the Cattell 16 Personality Factor Questionnaire. A modified test using the Dekan Movement Analyzer was used to secure measures of decision-making time. Results were gained by: (1) evaluation of the departure of sten scores on the 16 PF from the average, and by (2) running intercorrelations between personality variables and scores in the decision-making time test. Some Conclusions (1) The decision-making time test was a measure of self- confidence when correlated with personality variables. (2) When secondary factors were considered the top male competitors on the United States Team were introverted indicating self-sufficiency, prefers making his own decisions, is self-contained and confident. (3) As was not expected, the top male skiers were significantly more submissive (lacking in dominance). (4) Women team members showed more dominance (agressive, competitive) when compared to the top men skiers. Also, they were significantly more independent than their male counterparts. (5) Women skiers, as with the men, tended toward more introversion when compared to the average female population. (6) When compared with male national placegetters in swimming, the male skiers were less dominant and tough minded but were more introverted. The women skiers were more introverted than the women swimmers and were more serious minded and more self-sufficient.

Mr. Troy D. Bledsoe
University of Denver
Denver, Colorado 80210

April 5, 1971
3:45 p.m.

WOMEN'S MOTIVATIONS TO ENGAGE IN COMPETITIVE SPORT. Pearl Berlin, University of Massachusetts/Amherst

This investigation was regarded as a first step in the establishing and testing of a theory of the motives of college women to engage in competitive sport. Fundamental to the research are the following assumptions: (1) Theories are capable of yielding facts; therefore, factors about athletes self-conceptions may be interpreted as facts to be discovered about them; (2) motives are learned; they develop out of repeated affective experiences; achievement motives emanate from situations involving standards of excellence and competition with those standards; (3) achievement-oriented activity is influenced by opposing tendencies, i.e., the attractiveness of success and accompanying gratifications and pleasures and the repulsiveness of failure and its anxieties and disappointments. Four dimensions of the sport experience were identified in the hypothetical model being tested; (1) the challenge of mastery; (2) contributions to self-regard; (3) the enabling of expression; and (4) opportunities for social interactions.

A two-way structured Q-sort comprised of eighty statements representing the theory and connoting positive or negative dispositions was developed. Statements were derived from interviews with women athletes and from selected literature dealing with achievement motivation, personality dynamics in relation to skilled performance, and notions about some of the unique aspects of women's behavior. Judges, recognized authorities in the fields of motivation and women's sport, contributed their expertise to the selection of statements included in the sort.

Data were obtained from the sort scores of varsity athletes from six New England colleges currently involved in competition. Differences were ascertained for each of the sport dimensions; conclusions were related to the theory "built in" to the sort. Factor analysis of the intercorrelations of Ss sorts was undertaken to permit further explication and subsequent refinement of the model.

Pearl Berlin
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April 5, 1971
4:00 p.m.

A COMPARATIVE STUDY OF THE ABILITY OF BASKETBALL COACHES TO ASSESS THE PERSONALITY TRAITS AND PROFILES OF THEIR PLAYERS.

Glen R. Albaugh, Western Washington State College

Besides measuring the ability of coaches to accurately assess the personalities of their players, this study focused on the personality differences occurring within and between players' and coaches' groups that either strengthened or weakened the coaches' personality assessment ability. The self evaluating Athletic Motivational Inventory (AMI) measured the personality traits and profiles of all the subjects (N-117) including freshmen basketball players (N-48), varsity basketball players (N-53), and freshmen and varsity coaches (N-16). The Player Rating Scale (PRS) measured the personality assessment ability of the coaches through their respective ratings of their basketball players. The AMI and PRS were administered at four selected colleges and universities in the State of Utah during the month of November, 1969. The AMI and PRS both measured the same 11 personality traits, and with $p < .05$, r was used to calculate the correlations between these traits. Canonical correlation R compared the personality profiles of the PRS to the AMI. MANOVA was employed to determine profile variances between the freshmen and varsity players and the coaches on the AMI. ANOVA was used to locate existing differences across groups on the 11 personality traits of the AMI, and the Newman-Keuls Multiple Range test was employed to determine the specific location of the between group trait differences. Coaches were placed in personality assessment ability groups, and ANOVA was applied across these groups to locate any differences that existed on each of the coaches' 11 personality traits as measured by the AMI. Coaching experience and scores on Rokeach's dogmatism scale were added to the AMI's 11 personality traits for this measurement. Ten % of the total coaches' personality trait assessments of their players were significant ($p < .05$). Leadership, drive and determination were the personality traits most accurately assessed by the coaches. Coaches, particularly varsity coaches, most accurately assessed those personality traits on which they displayed their own highest trait scores on the AMI. Conversely, traits that coaches possessed to a lesser degree were those they less accurately perceived in their players. Varsity coaches, as compared to freshman coaches, were found to be more accurate in their perceptions. Coaching experience, scores on Rokeach's "D" scale, and coaches' personalities, as measured by the AMI, were found not to be a significant factor in the personality assessment ability of the coaches.

Glen R. Albaugh
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April 5, 1971
4:15 p.m.

DRUG ATTITUDES AND PERSONALITY CORRELATES OF THE UNITED STATES WORLD WRESTLING TEAM. Dr. Kenneth M.Cox, State College, Lock Haven, Pennsylvania; Dr. Richard A. Gilberts, State University, Superior, Wisconsin.

The study was concerned with the comparison of attitudes of the 1970 U.S. World Wrestling Team toward four drug categories: Stimulants, marijuana, depressants, and hallucinogens. Whether drug attitudes were related to specific personality variables was also tested. Subjects (Ss) for the study were forty-three champion collegiate wrestlers selected to participate in the U.S. World Free-Style and Greco-Roman Wrestling Training Camp. The measures consisted of a semantic differential designed to assess the connotative meanings of the four drug categories and the Group Personality Projective Test (GPPT). Drugs of abuse were seen by the Ss as slightly negative. Marijuana was reported as the least undesirable drug ($\bar{x}$ = 3.25) while hallucinogenic drugs (LSD) were consistently viewed as the most unacceptable ($\bar{x}$ = 2.37). Significant differences ($p \leq .01$) were detected between the responses to the four drug categories using analysis of variance design. Personality adjustment generally did not correlate significantly with drug attitudes. However, inverse significant correlations were detected between affiliation needs and attitudes towards depressants and hallucinogens. Succorance needs were positively related to depressant drugs. Socio-economic status (SES) assessments and educational levels of the Ss were correlated consistently and significantly with the drug categories. Marijuana attitudes were closely related to educational levels (r = .72). Age of the Ss correlated significantly (r = .63) with attitudes toward depressants. Father's occupation and drug attitudes were essentially uncorrelated, suggesting an even distribution of attitudes towards drugs across socio-economic classes. Other relationships identified were: the younger Ss responded more favorably to marijuana and less favorably to stimulants (r = .61) and depressants (r = .63). The lower SES subjects tended to be more emotionally disturbed (r = -.32). The older Ss tended to display more nurturance needs (r = .33) and come from higher socio-economic classes (r = .73).

Kenneth M. Cox, Ed.D.
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April 5, 1971
4:30 p.m.

COMPUTER SIMULATION OF A SHOT PUT. Tse-Kia Tcheng, Illinois State University.

When an object is catapulted or thrown through the air, the distance which the object travels is a function of (1) the acceleration of the object, (2) the angle of projection, and (3) the height from which the object was projected.

There are two methods to study the impact of each factor upon the range of the object: (1) building a simulated model to study the effect in a laboratory situation or (2) through the use of computer simulation techniques.

The purpose of this study is to write a series of simulation programs which give numerical and graphical out-put to evaluate the impact of each factor on the range of the shot put.

The equation used to calculate the range is as follows:

$$\text{Range} = \frac{V_0^2 \sin\theta \cos\theta + V_0 \cos\theta \sqrt{V_0^2 \sin^2\theta + 2gh}}{g}$$

A computer program was written to calculate the range of a simulated shot put with the option of holding any two factors constant to study the effect of the third factor.

Another program was written to generate out-put on the Calcomp plotter. It provided graphic representations of the results obtained.

The computer programs written for this study were very simple and economical in the use of computer time. Therefore, these programs could become valuable aids in the teaching of mechanical analysis of motor skills.

The findings of this study are (1) the relationship between velocity of the shot put and distance is positive; that is, other factors being equal, the greater the velocity the greater the distance obtained (2) if velocity of the shot put is held constant, the best angle of projection changes according to the height of the release point of the shot put. In general, the relationship is negative. The higher the point of release, the smaller is the angle of projection which yields the maximum distance.

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April 6, 1971
9:00 a.m.

THE EFFECT OF A RESISTIVE HEADGEAR AS A MEANS OF INCREASING CERVICAL STRENGTH. Charles J. Cantor, University of Illinois, Dr. Jack E. Razor (Advisor), University of Illinois.

This study was conducted to determine the effect of a resistive headgear as a means of increasing strength of the cervical musculature in the movements of hyperextension, lateral flexion to the left side, lateral flexion to the right side, and flesion. Forty-two male subjects, ages 18 to 21, volunteered to participate in the study. A method of random sampling was employed to assign subjects to one of three groups and the groups to one of three treatment conditions. The three groups were control (N = 14), exercise (N = 14), and headgear exercise (N = 14). A strain gauge, amplifier, and headstrap served as test instruments. Each subject was tested three times for each of the four movements previously mentioned during both pre and post test sessions. The experimental training period lasted five weeks during which time both exercise groups performed three sets of ten repetitions per set for each of the four exercises every Monday, Wednesday, and Friday. During the first week the headgear group used only the headgear (3 lbs.). A one-pound increment was added to the headgear each Monday. Exercises in both groups were always performed against gravity. An analysis of variance was employed to determine whether any significance existed between treatment conditions. The Newman-Keuls Method of determining where significance exists was then employed as a post hoc test. The cervical exercises for the movements of hyperextension, lateral flexion to the left side, lateral flexion to the right side, and flexion do significantly increase strength. The use of a resistive headgear, progressively weighted over a period of time, for the same four exercises, also significantly increases strength. The use of the headgear does, however, bring about a significantly greater increase in strength.

Charles J. Cantor
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April 6, 1971
9:15 a.m.

KNEE LIGAMENTOUS SEPARATION FORCE AS DETERMINED BY TRAINING, DETRAINING, AND INACTIVITY. Jerome Zuckerman, Queensborough Community College; G. Alan Stull, University of Maryland.

The purpose of this investigation was to determine the effects of training, detraining, and inactivity upon the medial collateral ligamentous separation force in adult, male, Wistar rats. The 107 subjects were randomly assigned to 11 groups as follows: (1) Group 1 (C) was sacrificed at the beginning of the study and served as the control; (2) Group 2 (SW+SA) was permitted spontaneous activity in addition to forced swimming for 8 weeks; (3) Group 3 (SW+SA-DET) swam and engaged in volitional exercise for 8 weeks followed by 8 weeks of detraining; (4) Group 4 (SA) was allowed 8 weeks of voluntary exercise only; (5) Group 5 (SA-SA) was permitted 16 weeks of volitional exercise only; (6) Group 6 (SW) swam for 8 weeks; (7) Group 7 (SW-SW) was not allowed to exercise volitionally but engaged in 16 weeks of swimming; (8) Group 8 (SW-DET) was forced to swim for 8 weeks preceding 8 weeks detraining; (9) Group 9 (IN) was inactive for 8 weeks; (10) Group 10 (IN-SW+SA) was inactive for 8 weeks followed by an 8-week period of swimming and spontaneous activity; and (11) Group 11 (IN-IN) was inactive for 16 weeks. Training consisted of swimming in a tank for 15 minutes per day, 5 days a week, with 2 percent body weight overload and/or running spontaneously in an exercise wheel attached to the animal's cage. The analysis of data indicated that the absolute separation force (ASF) and the separation force ratio (SFR) of the medial collateral ligament were enhanced by physical activity. Also, detraining did not have a detrimental effect upon the ASF of the ligament. Inactivity elicited no difference when compared to initial controls.

Jerome Zuckerman
Queensborough Community College
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April 6, 1971
9:30 a.m.

THE EFFECT OF PRACTICE ON VARIABILITY IN THE MOVEMENTS OF A GROSS MOTOR TASK: A CINEMATOGRAPHIC STUDY. Shirl James Hoffman, The University of Nebraska at Omaha

The purpose of the study was to determine the effect of practice on variability in the movements used to execute a jumping task. Ten fifth grade boys of similar physical proportions executed ten two-foot standing backward jumps for distance on each of eight days of practice. The performances on the first (FSI), fourth (FSII), and eighth (FSIII) practice days were filmed at a camera speed of 66 frames per second. The films were projected onto a grid surface of a film reader and coordinates were plotted for anatomical and background reference points for 900 relevant frames. The data was reduced, using computer techniques, to selected movement components. Spatial components of movement included the angles at the hip, knee, ankle and metatarsal-phalangeal joints and the angles of inclination with the horizontal of the trunk, thigh, leg and foot. Measurements were taken from the frame depicting take-off (TO), the frame occuring .15 seconds prior to TO (TO-10), and the frame depicting landing (L). Velocities of joint actions (temporal movement components) during the .15 seconds prior to TO were also determined. The standard deviations for each spatial and temporal component for ten trials were treated as scores and subjected to separate two-factor analyses of variance with repeated measures on both factors. Variability in joint velocities decreased significantly between FSII and FSIII. No significant differences in variability of angular velocities were observed between joint sites. Variability for three spatial components of movement decreased significantly (angle of hip and ankle at L and angle of ankle at TO) with practice. A small but significant increase in variability was observed for angle of ankle at TO between FSI and FSII. No significant changes in means for performance outcomes (distance scores) or variability in performance outcomes accompanied the changes in movement variability. The results indicated that changes in variability in movement may occur even when observable changes cannot be detected in the means for performance outcomes or variability in performance outcomes. The data also suggest that subjects engaged in a preliminary period of exploration in temporal movement components during the early practice session while subjects appeared to be relatively consistent throughout the practice experience in spatial movement components.

This study represents a portion of an EdD project completed at Teachers College, Columbia University under the direction of Bernard Gutin.

Shirl James Hoffman
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April 6, 1971
9:45 a.m.

DISTRIBUTION OF PRACTICE AS A FACTOR AFFECTING LEARNING OR PERFORMANCE. Paul Dunham, Jr., University of North Carolina

The purpose of this study was to investigate whether distribution of practice was a factor affecting learning or performance. Sixty students volunteered to serve as subjects and were randomly assigned to initially practice the Bachman Ladder Climb employing either massed or distributed practice. Subjects initially assigned to massed practice had eight minutes of continuous practice followed by a four minute rest. Subject assigned to begin with distributed practice had sixteen 30-second trials with inter-trial rests of 30 seconds duration prior to four minutes of rest. After rest half of each group was randomly assigned to continue practice under massed conditions and the other half under distributed. Thus resulting in the following post-rest groupings. Massed-massed (MM), massed-distributed (MD), distributed-distributed (DD), and distributed-massed (DM). Post-rest practice consisted of 6-30 second trials with 30 second intertrial rests for the groups assigned to distributed practice and 3 minutes of continuous practice for those assigned to post-rest massed practice. Results indicated that prior to rest the performance of subjects employing distributed practice was superior to those following the massed schedule, t =3.178 which was significant at the .05 level. Final performance was analyzed using analysis of variance and indicated that there was a significant difference at the .05 level. Posteriori comparisons made between the various practice groups employing Duncan's Multiple Range Test indicated that the practice groups MM and DD differed significantly at the .05 level as did groups MM and MD. Practice groups MM and MD exhibited a significant amount of reminiscence. Pre-rest and total performance change for all groups was found to be significant at the .05 level. Distribution of practice was concluded to be a factor affecting performance rather than learning.

Paul Dunham, Jr.
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April 6, 1971
10:00 a.m.

THE EFFECT OF FOUR METHODS OF SPARE CONVERSION INVOLVING VARIATIONS IN POINT OF AIM ON BOWLING ACHIEVEMENT OF COLLEGE WOMEN.
Joyce M. Curtis, Abilene Christian College.

The purpose of the study was to determine the effectiveness of four methods of spare conversion utilizing two, three, four, and five points of aim, respectively. Each method employed five basic approach positions, the strike, 7 pin, 8 pin, 9 pin, and 10 pin positions, respectively. A randomized group design was selected to analyze the data. The study was conducted within the required physical education program of the Department of Physical Education for Women at Indiana University during the Fall Semester, 1969-70. Forty-eight subjects were selected randomly and the experimental methods were assigned randomly to classes having 12 subjects each. All subjects were given instruction in the four step approach and hook ball delivery. Classes met twice weekly for one academic semester and each subject bowled 23 games. The analysis of covariance technique was utilized to evaluate the effectiveness of the four methods of spare conversion. Cumulative first ball average for the first five games of bowling was used as the covariant for all subjects in the analysis of covariance technique. Average and second ball efficiency scores for games 1-11, 12-23, and 1-23 were analyzed to measure achievement at various stages in the investigation. To determine if significant improvement in bowling skill occurred during the investigation, t-test comparisons were made between initial scores for games 1-11 and final scores for games 12-23 for subjects in each group, in terms of bowling averages and second ball efficiency scores. No significant differences were found among the adjusted mean averages or adjusted mean second ball efficiency scores for the four groups using different methods of spare conversion. A significant improvement in bowling average was experienced by all groups, with the largest net gain produced by the group using two points of aim. All four groups revealed a significant improvement in second ball efficiency scores, the largest actual net gain demonstrated by the two points of aim group. On the basis of the findings of this study, it appears that beginning bowling may be taught to college women with equally effective results by utilizing two, three, four, or five points of aim, with five basic approach positions, in knocking over those pins left standing after the first ball in a frame. The spare conversion method employing two points of aim is recommended for use in the instruction of beginning women bowlers due to its simplicity in application by student or beginning bowling instructor.

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April 6, 1971
10:15 a.m.

VELOCITY CURVE OF THE HORIZONTAL APPROACH OF THE COMPETITIVE LONG-JUMPER. Donald E. Campbell, Oregon State University

The purpose of this investigation was to assess the velocity curves which result from two conditions of the horizontal approach in the competitive long-jump in order to determine how maximal velocity might be achieved just before the take-off board is reached. Three experienced intercollegiate trackmen who competed primarily in the long-jump were used to determine horizontal velocity in the long-jump horizontal approach. Each subject was tested under two conditions with four trials in each condition. Condition one was performed without special preparation and during which the performer used his customary approach for the long-jump. Condition two was performed after the jumper had the knowledge of the results of the first condition and after the jumper had been trained to execute the horizontal approach with a gradual increase in velocity. Both conditions were assessed during competitive situations. Testing involved timing the subjects at four 25-foot intervals beginning at a point 100 feet from the board. The time required to traverse each of the four 25-foot intervals was converted to velocity in feet per second. The transposed data were treated by an analysis of variance for trend components to evaluate the velocity curve for the two conditions. Snedecor's formula for reliability of individual values was applied to the four trials for each condition in order to obtain an intraclass correlation of internal consistency. The analysis of variance of the trend components revealed that the F value for the within interval velocity was significantly different. The significant linear components F value suggested that the overall trend was essentially linear. For the First condition, a significant quadratic F value was obtained. This would be interpreted to mean that the jumpers reached their peak velocity before the last 25-foot interval and then declined in speed before reaching the board. For the second condition, a significant cubic F value was obtained. This would suggest that while the second series was also essentially linear, the jumpers developed velocity within the 25-foot intervals that was both less than and greater than the overall linear trend. The significant cubic F value suggests that jumpers developed the greatest velocity during the third interval but were unable to maintain that rate of acceleration in the last interval before reaching the board. The results of this second condition reveal, however, that with a more gradual increase in velocity, the jumpers were able to reach their peak velocity just before the take-off. The intraclass correlation coefficient values suggest a high correlation between the four trials for each of the two conditions.

Donald E. Campbell
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April 6, 1971
10:30 a.m.

A COMPARISON OF KNEE ACTIONS RECORDED DURING VERTICAL AND STANDING BROAD JUMPS. Dennis Huston, Washington State University; Marlene J. Adrian, Washington State University.

The purpose of this study was to compare knee actions involved when lifting the body weight during various forms of vertical and standing broad jumps and to compare variations within subjects and among subjects for the parameters measured. Four men and four women from the Washington State University intercollegiate basketball teams served as jumpers. Each subject performed three trials of the following: standard jump-reach test, deep crouch jump, quick jump, held knee flexion jump, "basketball jump ball" and a standing broad jump. Knee electrogoniometers were used to obtain goniograms for the angle of maximum flexion, the take-off angle and the angle of maximum extension. A contact mat was connected to an oscillograph in order to obtain the moment of take-off and the air time on the goniogram. These records were then used to calculate displacement of the center of gravity and the angular velocity of the leg at take-off. It was found that there was less extension at the knee joint at take-off in the standing broad jump than for the various styles of vertical jumps, with the quick jump displaying the greatest extension at take-off. For the standing broad jump, there was a positive relationship between distance jumped and the amount of leg extension in the air phase of the jump. However, the subjects did not attain the same amount of leg extension during the standing broad jump as during the vertical jumps. Maximum extension showed the smallest amount of variability in all vertical jumps when compared with the other parameters. The calculation of the vertical displacement from elapsed air time was always less than that recorded visually at the time of the jump.

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April 6, 1971
10:45 a.m.

THE EFFECT OF THREE EXPERIMENTAL TRAINING FACTORS UPON BASEBALL THROWING VELOCITY. William J. Sullivan, Springfield College.

The study was conducted in order to determine the effect of three experimental variables concerned with exercise training upon baseball throwing velocity. The three experimental variables were: (a) the type of training program (weight lifting vs. wall pulley), (b) the factor of resistance progression (progression vs. no progression), and (c) the factor of throwing practice (throwing vs. no throwing). A secondary purpose was to ascertain the degree of relationship between baseball throwing velocity and the strength of various muscle groups. The subjects were 48 university students enrolled in a conditioning course who volunteered to take part in the study. Each subject trained four days per week for a period of six weeks. The throwing velocity scores were obtained by utilizing a photo-electric device which gave a measure of ball flight in milliseconds over a distance of seventeen feet. Wrist flexion, medial arm rotation, and grip strength scores were recorded by using cable tension methods. The experimental design was a complete randomized groups design with a factorial arrangement of treatments. The data obtained from the post-test were analyzed by the analysis of covariance; the pre-test data served as the covariate. The multiple correlation coefficient was utilized to assess the degree of relationship between strength and throwing velocity. The conclusions were that baseball throwing velocity can be increased either by training with weights or by using the wall pulley and simulating the baseball throwing motion. However, the use of weight training exercises is significantly more effective in this regard. Progression of resistance and engaging in throwing practice has no effect on baseball throwing velocity. There is a low relationship between strength and baseball throwing velocity.

Dr. William J. Sullivan, Asst. Director, Division of Graduate Studies
Springfield College
Springfield, Mass., 01109

April 6, 1971
11:00 a.m.

PREDICTABILITY OF BEGINNER SKIING SUCCESS FROM BASIC SKILLS TEST IN COLLEGE AGE FEMALES. James E. Wolfe, Dean Junior College; H. H. Merrifield, Ithaca College.

The purpose of this investigation was to construct a test battery that would be feasible as a device for predicting early success in skiing. Twenty-two females between the ages of 18 and 24 who were beginner skiers served as subjects. The basic skill tests items included a balance test, side step test, modified hopscotch test and a weight-unweight test. The tests were administered to the subjects one day prior to the beginning of ski lessons. The Graduated Length Method was employed by certified ski school instructors. After the completion of five ski lessons, the subjects skiing proficiency was measured on one objective test and one subjective test. All skiing instruction and testing was performed at the Killington Vermont Ski Area. The test-retest method determined that all motor ability tests and skiing proficiency tests were reliable. A correlation matrix of the basic skill tests items and proficiency tests revealed that the selected tests were not highly related. The inter-correlation value for two tests, modified hopscotch test and objective skiing proficiency test, suggested that they be deleted from further analysis. Stepwise linear multiple regression analyses were made using the subjective skiing proficiency test as the dependent variable and considering the three remaining basic skills tests as independent variables. The result of this method revealed a two item test battery, consisting of the balance test and the weight-unweight test, to have a multiple correlation coefficient of .48 with the criterion measure. It was concluded that the formula $X_o = 1.488X_1$ (balance test) + $.225X_2$ (weight-unweight test) + 8.688 using raw scores from this battery could be recommended as a technique for selecting early success in skiing.

James E. Wolfe
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April 6, 1971
11:15 a.m.

DEVELOPMENT OF POWER VOLLEYBALL SKILL TESTS FOR COLLEGE WOMEN.
Jane Roberts, Mankato State College; Rute M. Helmen, Hamline University.

The purpose of the study was to develop a battery of power volleyball skill tests for college women. The need for research in women's power volleyball skill tests was indicated by the new trends and the limited studies. The subjects were seventy-six Mankato State College physical education majors and minors, enrolled in team sports classes. Three experienced power volleyball players rated the subjects during drills and in a game situation with a nine point rating scale. A battery of three tests was selected from among the experimental tests. Two thirty-second trials of the overhead volley test, two thirty-second trials of the bump-to-self test and three twenty-second trials of the wall spike test were administered twice to all the subjects. The Pearson Product-Moment Method was used to compute correlation coefficients. The inter-correlations of the judges' ratings yielded a sufficient degree of consistency. The test and retest reliability was obtained for all trial combinations of the individual tests and for the batteries. The judges' ratings and the test scores were correlated to determine validity coefficients for the individual tests and the batteries. Test one, the overhead volley, was the most reliable and valid of the three tests. The total of both trials resulted in coefficients of .76 for reliability and .69 for validity. The most reliable and valid test battery, consisting of the total of tests one, two and three, yielded coefficients of .84 for reliability and .73 for validity. The correlations between the subjects' height and the individual tests and batteries indicated no relationship between the two variables. These power volleyball tests are valid and reliable for college women.

Rute M. Helmen
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April 6 1971
11:30 a.m.

THE EFFECT OF CHANGING LEAD LEG, LEG STRENGTH AND ENDURANCE ON STEP TEST PERFORMANCE.* Donald J. Clark, University of Saskatchewan; Mohan Singh, University of Alberta, Edmonton, Canada.

The purpose of this study was to investigate the effect of changing lead leg on step test performance as indicated by changes in the fitness index of subjects. Subsidiary problems were to measure leg extensor strength, leg extensor endurance and examine their relationship to step test performance. Associated with the strength and endurance tests was the measurement of changes in heart rate during these two tests. Eighteen male freshmen enrolled at the University of Alberta volunteered as subjects for this study. Each subject completed six step test treatments involving changing lead leg every 30 seconds, every minute, every two minutes, right leg only, left leg only and subject's own choice.

Analysis of test results indicated that changing lead leg does not effect step test performance as indicated by changes in the fitness index of the subject. A significant relationship was found between leg extensor endurance and step test performance. The relationship between leg extensor strength and step test performance was not significant. Significant differences were found between heart rate changes during the maximal strength and endurance tests, however both tests did result in heart rate changes great enough to elicit a training effect.

*Supported in part by a research grant from the Department of National Health and Welfare, Ottawa, Canada.

Donald J. Clark
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April 6, 1971
11:45 a.m.

THE PATTERN OF RECOVERY FOLLOWING ISOMETRIC STRENGTH DECREMENT.

G. Alan Stull and David H. Clarke, University of Maryland.

The true pattern of recovery from isometric fatigue was determined by eliminating the accumulation of fatigue products from serial post exercise contractions, and by massing the observations during the early stages of recovery. The subjects, 31 adult men, were given a one-minute maximum isometric contraction, employing a hand ergograph, on each of six testing sessions. Following the exercise, at a stated interval, they then contracted once maximally. The rest periods were either 10, 35, 70, 115, 170, or 235 sec., administered in a random order. Results indicated a loss of approximately 50 per cent of the initial strength during the exercise period. The pattern of recovery was very rapid following the cessation of activity; during the initial 10 sec., approximately 36 per cent of the decrement was reacquired, after 35 sec. nearly half was regained, and by the end of 70 sec. approximately two-thirds was recovered. After slightly less than 4 minutes of rest, the strength level had returned by 98 per cent, a value not significantly different from initial strength ($t = 0.91$). The recovery curve was a two-component exponential, although the initial component was extremely rapid, and contributed to the overall recovery for the first 10 sec. only; thereafter, the recovery was controlled by a single exponential component, having a rate constant similar to that reported elsewhere for serial recovery tests. A major result of examining the time pattern of recovery was to identify the relatively spontaneous nature of recovery from isometric exercise.

David H. Clarke
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April 6, 1971
9:00 a.m.

A COMPARISON OF THREE TECHNIQUES FOR AIDING RECOVERY FROM SUBMAXIMAL EXERCISE. Leo H. Teghtmeyer, Jr., California State Polytechnic College.

The purpose of the study was to compare the degrees of recovery which occurred when three different techniques of aiding recovery were employed during a ten-minute recovery period between two periods of submaximal pedaling on a bicycle ergometer. The criteria used in determining the degree of recovery included the subjects' heart rates and pulmonary-ventilation and oxygen-consumption volumes during the pedaling and recovery periods. The following recovery techniques were employed: (1) lying supine with a cold pack placed on the abdomen; (2) lying supine with the lower extremities elevated; and (3) pedaling the ergometer slowly against minimum resistance. Fifteen male college students were tested on three occasions using a different recovery-period treatment on each occasion. The order in which the recovery-period treatments were administered was systematically rotated in order to nullify any training or learning effects. The data were treated statistically by using an analysis of variance and the Tukey test. The .05 level of confidence was accepted as the criterion of significance. Significant differences were found between the means of the heart rates and the pulmonary-ventilation and oxygen-consumption volumes only during the recovery period while different treatments were being employed. The mean heart rates were significantly higher when the subjects pedaled continuously during recovery than when the "cold-pack" or "legs-elevated" treatments were used. During the latter portion of the recovery period the pulmonary-ventilation and oxygen-consumption volumes were significantly greater when the "continuous-pedaling" treatment was employed than when the other two treatments were used. Since no significant differences were found in any of the three parameters during the second period of pedaling, it was concluded that the different treatments did not result in significantly different degrees of recovery. The differences in heart rates, oxygen-consumption, and pulmonary-ventilation volumes which were present during recovery were attributed to differences in the energy requirements of the different recovery-period treatments.

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April 6, 1971
9:15 a.m.

THE EFFECTS OF A MULTIPLE ERGOGENIC AID UPON STRENGTH, MUSCULAR ENDURANCE, AND RECOVERY, Travis W. Arterbury, Arkansas Polytechnic College.

Purpose of the study: The purpose of this study was to determine whether the ingestion of a multiple ergogenic aid containing 300 milligrams of citrated caffeine, 1000 milligrams of sodium citrate, 500 milligrams of sodium phosphate, 370 milligrams of dextrose, 75 milligrams of ascorbic acid, and 5 milligrams of thiamine would appreciably affect strength, muscular endurance, and recovery.

Procedure: Ninety-five male subjects were selected at random for participation in this study. These subjects were weighed, measured, and given a pre-test consisting of an initial strength test, muscular endurance test, and recovery strength test. Initial strength and recovery strength were measured using a cable tensiometer. Muscular endurance was measured on an arm ergometer which had a mechanical advantage of 10 and a work load of 100 pounds. The muscular activity of the subject was recorded on a physiograph to determine the fatigue level attained. The subjects were randomly divided into three groups--control group, experimental group A, and experimental group B. The two experimental groups were given ten daily doses of the substances under investigation. A double blind technique was employed with one group receiving the experimental dosage and the other receiving a placebo. A post test, indentical to the pre-test, was administered to each subject following the ten-day experimental period. During this test the subjects worked to the same level of fatigue as in the pre-test. The statistical procedures for the study included: (1) Analysis of variance applied to the pretest scores, (2) Fisher's t test for correlated means applied to the pretest mean scores and post test mean scores, (3) Fisher's t test for uncorrelated means applied to the upper and lower quarters of the difference scores for each group, (4) Fisher's t test for uncorrelated means applied to the upper and lower mean difference scores for each half of the scores for each group, (5) Analysis of variance administered to all post test scores.

Conclusions: A multiple ergogenic aid containing 300 milligrams of citrated caffeine, 1000 milligrams of sodium citrate, 500 milligrams of sodium phosphate, 370 milligrams of dextrose, 75 milligrams of ascorbic acid, and 5 milligrams of thiamine has no significant effect upon initial strength muscular endurance, or recovery from fatigue.

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April 6, 1971
9:30 a.m.

ACUTE FLEXIBILITY CHANGES ACCOMPANYING EXERCISE OF MIDDLE-AGED MALES. *William D. Ross, Simon Fraser University; J.E. Lindsay Carter, F.W. Kasch, G. Martin, San Diego State College.*

Stretching exercises and joint manipulation prior to running is a common practice in exercise programs. Sometimes such procedures are called "loosening-up" exercise and the inference is that they are accompanied by acute increases in the range of movement of the exercised parts.

The purpose of this study was to examine the phenomenon in 23 middle-aged males who had exercised at least twice per week for over one year.

The design of the study provided for three test procedures to be given in random order initially and terminally fourteen days later, interspersed with three other test days when the total group was divided into three sub-groups and tested in rotated sequence after 25 minutes warm-up, after 25 minutes running and after 5 minutes of tapering-off exercise. Thus, the group was tested after five antecedent conditions with flexibility scores by Leighton flexometer and sit-reach apparatus obtained for right and left arm; upper and lower back, sit-reach; and trunk rotation.

A sign test corrected for continuity for scores obtained after each antecedent condition compared to initial rest and interpreted at the five percent probability level revealed a significant z-value for sit-reach after warm-up. However, no other antecedent condition was associated with significant z-values for any of the six tests. From this study, using habitually exercising middle-aged males, in general it was not possible to demonstrate acute changes in suppleness accompanying typical warm-up, running and tapering-off antecedent exercise conditions. The relative stability of the sit-reach scores indicated by intercorrelation ranging from .899 to .980 for this item obtained after antecedent conditions suggests a systematic effect rather than unique individual responses.

A precautionary comment in interpreting these findings is perhaps necessary. Acute increase in range of movement is only one of the postulated values of preliminary stretching and manipulation of joints. The prophylactic effect of such procedures appears to have practically eliminated musculoskeletal problems in ongoing programs at San Diego and Simon Fraser University. The improvement in blood flow and other adjustments to stress and the apparent inducement of relaxation are also primary concerns. Moreover, even though acute changes of large magnitude were not demonstrated in this study on subjects who had experienced a year or more of training, younger subjects, females, or habitually sedentary novices of either sex may have an entirely different response.

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April 6, 1971
9:45 a.m.

RELATION OF PARTICIPATION IN PHYSICAL EDUCATION TO CERTAIN LABORATORY MEASUREMENTS ASSOCIATED WITH CHRONIC DISEASE*. Henry J. Montoye, Mary E. Frantz, Andrew J. Kozar **. Department of Epidemiology, School of Public Health, University of Michigan.

There was evidence (Research Quarterly, Oct., 1969 and May 1970) that students who are relatively unfit tend not to elect physical education (p.e.) in high school. It was of interest to determine whether the elective selected was related to certain laboratory measurements associated with such chronic disease as diabetes, heart disease and arthritis. The laboratory measurements included blood pressure, skinfolds, cardiac-thoracic ratio, heart rate response to exercise, total serum cholesterol, serum uric acid and glucose tolerance. The laboratory measurements were taken on the students, on the average, two years earlier. For many of the students, this meant that the laboratory measurements were done before he or she attended high school. In Tecumseh, Mich. where the data were collected, students may select p.e., band, chorus or art as their elective. The results indicated that those boys and girls who elect p.e. or band were leaner and more fit (as measured by heart rate response to exercise) than those children electing art or chorus. There were no significant differences ($p < .05$) among children selecting the various electives with regard to the other variables. When the children were classified as to whether they had elected p.e. every semester in H.S. or had never elected p.e. in H.S., those boys who elected p.e. were leaner and more fit (two years earlier) than those who did not elect p.e. The trend was the same for girls but the differences were not statistically significant. The values of the other laboratory variables were not statistically different between those electing and those not electing p.e. In conclusion it appears clear that children selecting p.e. and to some extent band as an elective in H.S. are leaner and more fit but they are no different with regard to blood pressure, serum cholesterol, serum uric acid, glucose tolerance or cardiac thoracic ratio.

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*Supported in part by Grant HE-12755 and Program Project Grant HE-09815, both of the National Institutes of Health, U.S.P.H.S.

**Now at the University of Tennessee

Henry J. Montoye, Ph.D.
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April 6, 1971
10:00 a.m.

A TWENTY-YEAR STUDY OF PHYSICAL FITNESS OF ENTERING FRESHMEN AT TEXAS A & M UNIVERSITY. Linus J. Dowell; Carl W. Landiss; Emil Mamaliga, Texas A & M University.

Purpose: To compare entering freshmen at Texas A & M University for the twenty-year period, 1948-1968, in selected components of physical fitness.

Procedure: Entering male freshmen students at Texas A & M University have taken the Texas A & M Physical Fitness Test each fall since 1947. This test is a modified version of the Army Air Force Physical Fitness Test. The test includes pull-ups, sit-ups, and 300-yard shuttle run. These tests have been established as relative effective measures of strength, endurance, and speed.
In order to determine differences in the physical fitness of entering freshmen over the past two decades, raw scores of 5,630 subjects in pull-ups, sit-ups, and times in the 300-yard shuttle-run were punched on IBM cards for the years 1948, 1958, 1963, and 1968. The year 1963 was chosen because of interest in the initial impact of the President's Council on Youth Fitness. In order to get a recent picture of trends in physical fitness 7,628 entering freshmen at Texas A & M University for six consecutive years 1963-1968 were compared in physical fitness. Analysis of variance was used to determine differences.

Conclusions:

1. Muscular endurance of entering college freshmen as measured by sit-ups has steadily improved over the past twenty years.
2. Entering college freshmen increased in strength from 1947 to 1963 but strength of entering freshmen has steadily declined since 1963.
3. Speed-endurance as measured by the 300-yard shuttle-run has fluctuated over the past 20 years to the extent that no definite trend can be identified.

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April 6, 1971
10:15 a.m.

THE DYNAMIC STRENGTH OF THE FOREARM FLEXORS MEASURED WITH THE HILL INERTIA WHEEL AND ITS RELATION TO UPPER ARM DIMENSIONS DETERMINED VIA ANTHROPOMETRIC MEASUREMENTS. Sylvia J. Robertson, Texas Woman's University.

The purpose of this study was to determine the relationship between the dynamic strength of the forearm flexors measured with an inertia wheel and the girth of the upper arm of 100 university women. In this study, the principle of the Hill Inertia Wheel was utilized which permits the subject to apply a torque to a heavy steel wheel consisting of eight pulleys of varying radii mounted on ball bearings. The wheel is free to rotate; therefore, the subject's arm can be flexed or extended through its full range of motion. Dynamic strength can then be measured by calculating the maximum force developed or total work produced. The strength test was repeated by each subject within a thirty minute time period in order to examine the reliability of the dynamic strength test. The data relating to the girth of the upper arm were collected by measuring the upper arm of each subject with a Gulick anthropometric tape. The coefficients of correlation for the reliability of the scores obtained from the dynamic strength test on three of the pulleys on the inertia wheel resulted in .80, .87, and .90. The relationship between the dynamic strength of the forearm flexors measured by three of the pulleys on the inertia wheel and the girth of the upper arm yielded correlation coefficients of .43, .37, .34, and .41 when the total of the best scores acquired by each individual subject were treated. A test of significance was applied to the correlation coefficients and yielded values which were greater than the .01 level of probability which indicated that the correlations showed a significant relationship and should not be considered due to chance. The results of the investigation indicate that dynamic strength can be measured by utilizing the principle of the Hill Inertia Wheel. Although many methods of measuring dynamic strength have been developed, the measurement of dynamic strength without involving mastery of some skill has been a major concern. The inertia wheel is an instrument that may be utilized to study dynamic strength without involving the development of skill. The significant degree of positive relationship between the girth of the upper arm and the dynamic strength of the forearm flexors indicates that dimensional measurements of muscle groups give some indication of the force producing capabilities of that muscle group but is not sufficient to consider for predictive purposes.

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April 6, 1971
10:30 a.m.

THE RELATIONSHIP BETWEEN THE RESPONSE OF MUSCLE TO SUPRATHRESHOLD STIMULUS AND HYDROSTATIC PRESSURE. Charles Brooker, Slippery Rock State College.

This study was designed to determine whether changes in hydro static pressure within the physiological range, altered the response of a nerve-muscle preparation in terms of duration of events, force produced, and velocity of response. Twenty gastrocnemius-sciatic nerve preparations from Rana pipiens were subjected to stimulus levels high enough to assure total recruitment. The conditions of the experiment were altered so that specimens were subjected to pressures of 90 mm Hg to 200 mm Hg by 10 mm Hg increments. Measurements were recorded on a Physiograph recorder at a paper speed of 125 mm/sec. Muscle contraction was transduced by a Statham UC2 load cell. The muscles had a mean mass of 2.1 gms, S.D.=1.0 gms, with a range of 3.4 gms to 1.85 gms. Each preparation was subjected to precontraction tensions of 10 gms, 20 gms, and 30 gms respectively at each of the hydrostatic pressure levels. In order to eliminate the effect of sequence, load and pressure changes were distributed according to a Latin Square configuration. The results indicated a non-linear negative relationship between pressure and duration of the latent period, and between prestimulus stretch and duration of latent period. It appeared that as the pressure increased the time required for the muscle to contract after a stimulus was reduced. Further, while the time required for total contraction rose in all cases as the load increased, it rose more slowly as the pressure increased, and did not rise so far. Small increases in hydrostatic pressure increase the excitability of the muscle and the velocity of its contraction. These changes were significantly different at or above the 0.05 level.

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April 6, 1971
10:45 a.m.

EFFECTS OF VARIOUS UNILATERAL EXERCISE PROGRAMS ON STRENGTH AND WORK OF CONTRALATERAL MUSCLE. David A. Kaufmann, University of Florida

The purposes of this study were to compare the effects of different programs of unilateral resistance exercise on the strength and work of ipsilateral and contralateral abduction of the fifth finger at the metacarpophalangeal joint, and to compare, by using the dominant and the nondominant arm as the active arm, the effects of a six-executions-maximum program of unilateral resistance exercise on the strength and work of the ipsilateral and contralateral arms for forearm flexion at the elbow joint. One hundred-thirty male students from the physical conditioning classes at the University of Iowa were randomly selected for this study. Each student was given an initial test in strength and work on the ipsilateral and contralateral hand or arm. Each subject was randomly placed into one of the following groups: 1) finger control; 2) finger 25-executions maximum; 3) finger 6-executions maximum; 4) forearm control; 5) forearm dominant 6-executions maximum; 6) forearm nondominant and 6-executions maximum. After exercising each Monday, Wednesday and Friday for six weeks, each subject was given a final test in strength and work on the ipsilateral and contralateral hand or arm. The data were analyzed by the t test for correlated samples, analysis of variance, analysis of covariance and when necessary the Scheffe Test for Multiple Comparisons. A P of .05 was selected to denote statistical significance. The reliabilities of the various measurements ranged from a low of .83 to a high of .99. No statistically significant cross-education effects for strength in finger abduction at the fifth metacarpophalangeal joint were found. Statistically significant cross-education effects for work in finger abduction at the fifth metacarpophalangeal joint were found. From the findings of this study it appears that cross education for work in finger abduction at the fifth metacarpophalangeal joint for the normal, male, college-age population has been demonstrated.

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April 6, 1971
11:00 a.m.

AN EVALUATION OF TWO METHODOS OF CURL-UPS IN THE DEVELOPMENT OF ABDOMINAL STRENGTH, LOW BACK STRENGTH, AND THE LOSS OF WAIST GIRTH. Mary Jo Nitsch, Texas Woman's University, Denton, Texas.

The purpose of this investigation was to determine which of two methods of exercise would produce the more positive changes in strength and waist girth of the abdominal area without causing a subsequent increase of strength in the low back. This investigation entailed a study during a ten-week period of two methods of curl-ups in the development of abdominal strength, low back strength, and waist girth change. Subjects in experimental Group I performed the bent knee curl-up; subjects in experimental Group II performed the half curl-up with bent knees; subjects in the control group refrained from any specific abdominal exercise during the testing period. Trunk flexion strength, trunk extension strength, curl-ups, waist girt, height, weight, age were assessed before and after the ten week period. Measurements were obtained from each of the subjects through the use of a cable tensiometer and an anthropometric tape. Descriptive data were computed for each variable on the pre-test and the post-test. The analysis of variance technique for the significance of the difference between the three groups was computed for the pre-test and the post-test. Duncan's Multiple Range technique was used to determine where the deviation between the groups existed where a significant F ratio was found. The t-test for the significance of the difference between the means of the pre-test and the post-test was applied for each variable. Based upon the results of the study, it was concluded that both of the exercise methods would produce significant changes in the performance of abdominal strength as measured by the trunk flexion test and the unlimited curl-up test. Only the half curl-up with bent knees produced differences in this performance of low back strength as measured by the trunk extension test. Waist girth, weight, and height were not significantly affected by any of the exercise methods.

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April 6, 1971
11:15 a.m.

A PILOT STUDY OF POSTURAL BALANCING ON TRACKING EFFICIENCY OF BLIND SUBJECTS*. Karl K. Klein, University of Texas at Austin; Otis Budd and Patti Welch, Texas School for the Blind, Austin; K. Dyo, M.D. Children's Medical Center, Austin, Texas.

The purpose of the research was to test the effect of the heel lift procedure to laterally balance the pelvis and legs and to determine its effect on correction of veering tendencies in forward movement. There were four phases to the design of the study as follows: Phase 1 - 58 blind subjects were selected from the school population for standing lateral postural measurement of the post. iliac spines to determine lateral pelvic asymmetry. Manual measurement techniques used have established objectivity and reliability "r" of .94 -.97. Calibrated blocks from 1/8-1" were used as lifts to determine the amount of lateral imbalance and other criteria related to the functional status of postural imbalance were used for group selection. Experimental 19 subjects and Control 17 subjects; Phase 2 - Both groups were tested for veering and straight line walking over a prescribed level course, movement patterns were recorded; Phase 3 - Experimental subjects were fitted with regular shoes with a heel lift to laterally balance the pelvis. The shoes were worn for 3 months and kept in good repair; Phase 4 - Postural and ambulation tests were readministered to both groups after 3 months. Data analysis was based on test-retest procedures for both postural as well as tracking changes. Conclusions: In the test-retest comparisons, individual and group data indicated that the use of the heel lift procedure has the following effects: (1) to effect a postural correction on young growing subjects, (2) to increase the forward tracking efficiency of subjects after a period of time. Exp. group: Improving in both of these areas, 66% of the subjects 9-14 years corrected lateral postural asymmetry, 73.6%(14) of the 19 subjects improved their forward tracking efficiency. Control group: 4 of the subjects 12-14 years of age increased in lateral asymmetry. 23%(4) appeared to improve tracking efficiency, 8 subjects remained the same and 5 decreased in their tracking efficiency.

*This research was partially supported by the University Research Institute

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April 6, 1971
11:30 a.m.

THE RELATIONSHIPS BETWEEN SELECTED ANTHROPOMETRIC AND ROENTGENOGRAPHIC MEASUREMENTS OF THE CALF MUSCLES, FOOT AND LEG, STATURE, BODY WEIGHT, AND STRENGTH AND MOVEMENT TIME OF THE ANKLE EXTENSORS. Ruth M. Rogers, West Texas State University.

Authors have alleged that the relative length of the heel and forefoot is an important determinant in the efficiency of the ankle and leg for propulsive power. This concept implies that the development of the calf muscles is dependent upon the type of foot which is present in the individual. It was hypothesized that an accurate validation of the role of the leg muscles in ankle dynamics might be achieved, and that factors which influence development of the calf muscles might be identified. The relationships between selected measurements of the calf muscles, foot and leg, as well as stature, body weight, and the biomechanical factors of strength and movement time of the ankle extensors were investigated. The measurements were obtained by roentgenographic analysis, anthropometric techniques, cable tension methods, and the Rogers Movement Time Meter. The subjects were 100 college women at the Texas Woman's University who volunteered to participate during the academic year of 1969-1970. Techniques for Pearson's product-moment correlation as well as partial and multiple correlation were the statistical procedures used. From the results of the study it was concluded that the factor which is most highly related to the development of the calf muscles is body weight, the bony lever system showing very little relationship to this development. The performance capacity of the muscles as indicated by measures of strength and movement time correlates only slightly with the dimensional characteristics of the muscles or the levers of the foot, demonstrating that other factors are primarily involved in the production of these phenomena.

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April 6, 1971
11:45 a.m.

Forearm Muscle Blood Flow During Sustained Muscular Contraction in Trained and Untrained Men. R. H. Rochelle, Univ. of Calif., Santa Barbara; S. Robinson, Indiana University; and D. B. Dill, Nevada Southern University.

Forearm muscle blood flows (FMBF) were followed during a 1-minute sustained contraction at 20% and 40% of maximum voluntary contraction (MVC) and during a 12-minute recovery period. Muscle blood flow was determined by the counterpressurization method, utilizing an electro-capacitance plethysmograph. Five swimmers, highly trained for endurance swimming events, constituted the experimental group, and five untrained subjects served as the control group. All subjects (swimmers and controls) were tested three times, after four weeks and ten weeks of training, and six weeks of detraining by the swimmers. The statistical treatment of data included a 2 x 2 x 4 factorial analysis of variance design with repeated measures on two factors. A significant increase in FMBF was found during sustained contraction at each of the testing periods in both groups. There was no significant change in FMBF consequent to intensive physical training, nor was their a significant difference between FMBF at 20 and 40% of MVC. The effect of physical training on the restoration of FMBF is unclear. The swimmers' exponential rate constant was significantly decreased from 0.0245 sec^{-1} at the 4th week of training to 0.0205 sec^{-1} at the 10th week of training. The exponential rate constant of the swimmers was significantly higher than that of the controls at 40% of MVC for each of the testing periods. Both groups exhibited a significant increase in recovery time at 40% MVC when compared to 20% MVC. It is postulated that the increased blood flow during sustained contraction is brought about by an increased blood pressure resulting from a reflex from the ischemic muscle. Possibly the pressor response to the sustained contraction is so powerful that it overrides any physical training influence. However, sustained and rhythmic contractions do elicit quite different responses from the cardiovascular system.

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April 6, 1971
12:00 noon

RESEARCH SECTION SYMPOSIUM
THE ROLE OF PERCEPTION IN LEARNING MOVEMENT ACTIVITIES

Sunday, April 4
10:45 a.m. - 12:15 p.m. - Room

MODERATOR: Marguerite Clifton, Purdue University, Lafayette

PRESENTATIONS: "Status of Research on Children with Perceptual Motor Dysfunction" -- B. Robert Carlson, University of Kansas, Lawrence.

"Perceptual Motor Research - Guidelines for the Future" -- Hope Smith, Purdue University, Lafayette.

RESEARCH SECTION SYMPOSIUM

THE ACADEMIC DISCIPLINE AND THE SCHOOL PROGRAM:
BRIDGING THE GAP BETWEEN RESEARCH AND PRACTICE

Monday, April 5, 1971
9:30 a.m. to 11:30 a.m. - Room

MODERATOR: Hal Lawson, University of Washington, Seattle

PRESENTATIONS:

"The Analysis of Teacher Performance" -- William Anderson, Teachers College, Columbia University, New York.

"The Application and Implementation of Research Findings in the Curriculum" -- Wayne Van Huss, Michigan State University, East Lansing

"Research as Viewed by the Teacher" -- Robert Broderick, Woodbury Public Schools, Connecticut

"Research Experiences in Professional Preparation" -- Henry Montoye, University of Michigan, Ann Arbor

RESEARCH COUNCIL SYMPOSIUM
ON THE SOCIAL PSYCHOLOGY OF THE EXPERIMENTAL MILIEU

Monday, April 5, 1971
4:45 p.m. - 6:00 p.m.

MODERATOR: William P. Morgan, University of Wisconsin, Madison

PRESENTATIONS: "Volunteerism, the Beneficent Subject, and Ecological Validity" -- Harriet G. Williams, University of Toledo

"Demand Characteristics and Experimenter Bias" -- Rainer Martens, University of Illinois

"The Deception Paradigm and Debriefing" -- Daniel M. Landers, University of Illinois

"Methodological Controls" -- Robert N. Singer, Florida State University

RECORDER: John A. Roberts, University of Missouri, Columbia

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